The Analysis of Impact of Korean Direct Investment in China on the China-South Korea Trade Deficit

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Abstract. With the signing of the China-Korea bilateral free trade agreement in 2015, the relationship between China and South Korea's trading partners has been further clarified. However, China's trade account with South Korea has been in deficit for successive years, and as South Korea's direct investment in China has increased, the deficit has become more apparent. Based on the introduction of the status of South Korea's direct investment in China and China-South Korea trade, this article analyzes the theoretical mechanism and empirical analysis of the impact of South Korea's direct investment in China on the China-South Korea trade deficit, and makes relevant suggestions for reducing the China-South Korea trade deficit.

Keywords: direct investment, trade deficit, processing trade, impact.

1. South Korea's direct investment in China and China-South Korea trade deficit

1.1. Status of Korea's Direct Investment in China
First, South Korea's direct investment in China has increased. China and South Korea have similar cultural origins and adjacent geographical advantages, which has laid the foundation for the establishment and development of bilateral trade cooperation relations. Economic complementarity has further promoted the development of bilateral economic and trade relations. Complementary advantages and China's huge market potential caused a large influx of South Korean foreign capital into China. Since the establishment of diplomatic relations between China and South Korea in 1992, South Korea has increased direct investment in China. However, according to data from the Korean Export-Import Bank, the amount of direct investment in South Korea in 1992 was only US $ 192 million. And it reached 6.248 billion US dollars in 2004, created a record high. Since 2010, South Korea's investment in China has generally shown a steady development trend. After creating a peak of US $5.206 billion in 2013, it fell to US $3.215 billion in 2014. After the fall of 2014-2017, the amount of South Korea's direct investment in China increased to US $4.766 billion in 2018, maintaining a relatively stable trend.

Second, the distribution of South Korean direct investment industries in China is uneven, with manufacturing investment as the mainstay. As China has a comparative advantage in labor costs, South Korea's direct investment in China is dominated by manufacturing and concentrated in labor-intensive industries such as clothing, textiles, food, and beverages. In recent years, the investment field has gradually shifted to heavy industries and some technology-intensive industries. The investment in service industries such as finance, insurance and education is obviously insufficient.
According to the data from the Export-Import Bank of Korea, of the amount of South Korean direct investment in China, manufacturing accounts for 79% of the total investment. Other industries, such as real estate, finance and insurance, transportation, and retail, had relatively few investments. In 2013, South Korean manufacturing industry's direct investment in China was US $ 4.498 billion, accounting for 86.4% of the total direct investment in China that year.

1.2. Status of China-Korea Trade Deficit
Since the establishment of diplomatic relations between China and South Korea, the two countries have made remarkable achievements in economic and trade cooperation. However, China's trade deficit with South Korea has not changed. This has attracted the continuous attention of the government and inevitably became the focus of trade between the two countries. From 2005 to 2018, China still maintained a deficit trend with South Korea. Among them, China's average annual export value to South Korea is US $ 78.9 billion, but the average annual import value is US $143.9, and the average annual trade deficit is US $ 65 billion. Except for the impact of the international financial crisis, China's and South Korea's import and export balances and deficits in 2009 decreased significantly, and a short-term decline in 2015 and 2016, the trade deficit between China and South Korea continues to increase. In 2018, China's trade deficit with South Korea reached US $ 95.85 billion.

2. Analysis of the influence mechanism of South Korean direct investment in China-South Korea trade deficit

2.1. High demand from subsidiaries for home country imports lead to a significant increase in China-Korea

The theory of international direct investment states that direct investment by the investing country to the host country will have an export-induced effect, that is, the establishment of a subsidiary by the parent company in the host country can cause the subsidiary to demand for related equipment, parts and components, intermediate products, capital technology and services to create exports from the investing country to the host country. The increase in South Korea's exports to China is largely due to the import of raw materials by Korean companies investing in China. Because South Korea’s direct investment in China is mainly to transfer the processing and manufacturing links in its production process, and the localization of South Korean enterprises in China is relatively low, the machinery, equipment, parts and technology needed to invest in China to set up factories are relying on a large number of imports from home countries. According to the survey data of Korean companies in China by the Korean Trade Association, in 2018, more than 40% of the raw materials and components of Korean companies in China were imported from South Korea. The added value of machinery and equipment is high, and the amount of imports is large. Therefore, South Korea's direct investment in China has greatly increased China's imports from South Korea.

2.2. The low resale ratio leads to an insignificant increase in China-Korea exports

The theory of international direct investment believes that international direct investment can also bring reverse import effects to the investing country, that is, the enterprises of the investing country transfer the production base of a product abroad through foreign direct investment, and then import the product from foreign branches. However, most of the South Korean investment companies in China are vertical investments. In China, they are mainly engaged in processing and assembly, and then the processed goods were exported to Europe, America, Japan and other countries through China. Rarely are they sold back to South Korea. In 2018, the proportion of Korean-funded enterprises in China that sold products to South Korea was only about 16%, it means the reverse import effect was small. Because the proportion of finished products sold back to South Korea in China is very low, China’s exports to South Korea have not increased. Those trade surpluses that should have been China’s trade
with South Korea have been transferred to China’s surplus with other countries, which cannot offset China’s Increase in imports from South Korea.

2.3. The combined effect of high import demand and low resale rate widens the trade deficit
Although there are many reasons for China's trade deficit with South Korea, differences in comparative advantage, market capacity, and trade protection also exist between China and other developed countries, but they have not resulted in huge deficits. South Korea’s direct investment in China has increased China’s imports from South Korea, but exports to South Korea have not increased much. The overall effect of this has exacerbated China’s trade deficit with South Korea. As stated by a report by the Ministry of Industry and Resources in 2018, Of the China-Korea trade deficit, the processing trade and equipment investment deficit accounted for 57.4%, and the general trade deficit accounted for 42.6%. Most of the China-South Korea trade deficit was due to processing trade and equipment investment. Therefore, I think that the growing trade deficit between China and South Korea in recent years has a greater correlation with the way South Korea's direct investment in China.

3. Empirical analysis of the impact of Korean direct investment in China on the China-South Korean trade deficit

3.1. Data preprocessing
It is generally believed that the increase in FDI inflows will not immediately cause an increase in imports and exports that year. After foreign direct investment enters the host country, investment in new construction or merger and acquisition of enterprises, introduction of equipment and training of employees, and the production and export of products require a process, so FDI should have a lagging effect on imports and exports. We use FDI to represent the amount of foreign direct investment in the year, TFDI to represent the cumulative foreign direct investment, and TFDIC to represent the cumulative foreign direct investment in the previous year. The sample interval selected in this article is the data for 2005-2018. The actual use of Korean foreign direct investment (FDI) data comes from the Export-Import Bank of Korea. The data on China’s exports to Korea (EX) and imports to Korea (IM) are from China business lounge. First, in order to eliminate the heteroscedasticity in the time series, the natural logarithms of EX, IM, FDI, TFDI, and TFDIC are taken to obtain the sequences LEX, LIM, LFDI, LTFDI, and LTFDIC, and then the ADF unit root test is performed. It does not change the relevant properties of time series data.

![Figure 2. Sequence diagram.](image)
From Fig. 2 and Fig. 3, it can be seen that the original sequences of LEX, LIM, LFDI, LTFDI, and LTFDIC have a clear upward trend, which is initially determined as an unstable sequence, and the sequence after the first order difference has no obvious trend. Shows stable characteristics, which can be further tested.

3.2. ADF unit root test

Perform ADF stationarity tests on LEX, LIM, LFDI, LTFDI, and LTFDIC, and determine the length of the optimal lag distribution according to the minimum value of the AIC criterion and the SC criterion, which is the Schwartz criterion. Output results at a significant level.

**Table 1. ADF unit root inspection.**

| variable    | Inspection form | ADF test statistics | 5% Critical value | Conclusion   |
|-------------|-----------------|---------------------|-------------------|--------------|
| LFDI        | (C,T,1)         | -3.756449           | -3.875302         | Non-stationary |
| LEX         | (C,T,0)         | -2.895714           | -3.828975         | Non-stationary |
| LIM         | (C,T,0)         | -1.787225           | -3.828975         | Non-stationary |
| LTFDI       | (N,N,1)         | 1.634862            | -1.974028         | Non-stationary |
| LTFDIC     | (C,T,2)         | -1.166468           | -4.008157         | Non-stationary |
| LFDI(1)     | (C,N,1)         | -4.225848           | -3.175352         | Stationary    |
| LEX(1)      | (C,T,2)         | -5.285823           | -4.008157         | Stationary    |
| LIM(1)      | (N,N,0)         | -2.394028           | -1.974028         | Stationary    |
| LTFDI(1)    | (C,N,O)         | -4.047908           | -3.14492          | Stationary    |
| LTFDIC(1)   | (C,N,O)         | -4.379393           | -3.175352         | Stationary    |

It can be seen from Table 1 that the ADF statistics displayed by the original time series data of all variables fall within the range of the acceptance range at a significant level of 5%, indicating that the original time series data are non-stationary; After the first-order difference, the displayed ADF statistical values fall within the rejection range at a significant level of 5%, indicating that the data of these variables are stable after the first-order difference, and the co-integration test can be continued.
3.3. Engle-Granger co-integration test

If the two variables are non-stationary simple integral sequences of the same order, then there may be a long-term stable relationship (that is, a cointegration relationship) in their linear combinations. Since LEX, LIM and LFDI, LTFDI, LTFDIC are all first-order single integer sequences, co-integration tests can be performed between LEX, LIM and LTFDI, LFDI, LTFDIC. This article will use the Engle-Granger two-step test. It requires OLS least squares to perform linear regression on the variables, and then to perform a stationary test on the residuals of each OLS linear equation. If the residuals are stable, it means that there is a co-integration relationship between these variables; if the residuals are not stable, there is no cointegration relationship. Considering the problem of time lag, the cumulative foreign direct investment with a lag of one year and the year's foreign direct investment were selected to perform linear regression with imports and exports respectively. From the unit root test, we can see that: LTFDIC, LEX, LIM, LFDI are all first-order single integers. The OLS method gives the regression equation as follows:

\[ \begin{align*}
    LEX &= 4.07 + 0.23LFDI + 0.33LTFDIC \\
    LIM &= 4.38 + 0.29LFDI + 0.35LTFDIC
\end{align*} \]  

(1) (2)

dl = 0.905 and du = 1.551 are obtained through the look-up table, and the DW value of equation (2) is low, indicating that the residual sequence may have auto-correlation.

So we need to make auto-correlation correction to equation (2) and get:

\[ LIM = 3.97 + 0.31LFDI + 0.41LTFDIC \]  \[ \{AR(1) = 0.16\} \]  

(3)

The corrected DW value is 1.58, which is improved compared with that before correction, and the residual auto-correlation is eliminated. And the stationary test results of the residuals of the regression equations (1) and (3) show that the P values are less than 5%, that is, the null hypothesis can be rejected at a significance level of 5%, indicating that LIM and LFDI, LFDIC, There is a cointegration relationship between LEX and LFDI and LTFDIC.

| t-Statistic | Prob.* |
|-------------|--------|
| Augmented Dickey-Fuller test statistic | -2.151888 | 0.0358 |
| Test critical values: | 1% level | -2.792154 |
| | 5% level | -1.977738 |
| | 10% level | -1.602074 |

**Figure 4.** ADF test of residuals.

| t-Statistic | Prob.* |
|-------------|--------|
| Augmented Dickey-Fuller test statistic | -4.051114 | 0.0007 |
| Test critical values: | 1% level | -2.771926 |
| | 5% level | -1.974028 |
| | 10% level | -1.602922 |

**Figure 5.** ADF test of residuals.

3.4. Conclusion

According to Eq.1, for every unit change in South Korea’s direct investment in China that year, China’s exports to South Korea will change by 23% in the same direction; for every unit change in South Korea’s cumulative direct investment after one year in China, China’s exports to South Korea will change by 33% in the same direction, there is a significant positive correlation between China's export trade to South Korea and South Korea's direct investment in China. According to Eq.3,
for every unit change in South Korea’s direct investment in China that year, China’s imports to South Korea will change by 31% in the same direction; for every 1% change in South Korea’s cumulative direct investment value after one year in China, China’s imports to Korea will be the same. The change in direction is 41%. There is a significant positive correlation between China’s import trade with South Korea and South Korea's direct investment in China. In summary, for every unit change in South Korean direct investment in China, the trade deficit between China and South Korea will change by 8% in the same direction. There is a significant positive correlation between the trade deficit between China and South Korea and South Korea's direct investment in China, which is consistent with the analysis results above.

4. Proposals to reduce China-Korea trade deficit

The trade deficit between China and South Korea seriously affects the stable development of the economic and trade relations between China and South Korea. From the analysis above, we can see that South Korea's direct investment in China is an important reason for exacerbating China's trade deficit with South Korea. Therefore, it is necessary to take measures from the perspective of direct investment to improve the trade deficit.

4.1. Guide Korean companies to purchase in China

After Korean companies invest and set up factories in China, a large amount of raw materials and components need to be imported from South Korea, and capital equipment is a high value-added product, which has led to a significant increase in China's imports to South Korea. Under such circumstances, measures can be taken to actively guide Korean-funded enterprises to reduce their reliance on machinery, equipment, raw materials and components in their home countries, encourage them to purchase Chinese raw materials and parts, and increase the procurement rate of domestic products by Korean companies in China. Increase its level of localization to reduce imports from South Korea and improve the deficit. For Korean companies, increasing procurement in China will help reduce transportation cost and tariff costs for imports from South Korea, while also reducing time costs and improving production efficiency. To increase the procurement rate of Korean companies in China, on the one hand, Chinese companies need to improve their technological level, improve product quality, strengthen technological innovation, actively communicate and cooperate with similar Korean companies, and provide parts and machinery suitable for their production according to customer needs. On the other hand, the government should formulate appropriate preferential policies to encourage Korean companies to purchase.

4.2. Improving foreign investment policies and strengthening the correct guidance of foreign investment flows

South Korea's direct investment in China has promoted China's exports to other countries, such as Europe, the United States and Europe. It is closely related to China's current investment model and foreign investment policy. China's super-national treatment and various preferential policies for foreign investment have attracted a large number of foreign investment. A large part of this is foreign direct investment from countries in the Asia-Pacific region. South Korea's direct investment in China is a major manifestation of its industrial transfer. Therefore, China should reduce the level of preferential access to labor-intensive industries, adjust the preferential policies for processing trade, gradually reduce it to the abolition of super national treatment, and control the transfer of labor-intensive industries from South Korea to reduce the resulting products. The change of flow direction has eased the trade deficit between China and South Korea.

4.3. Guide Chinese companies to invest in South Korea

China's investment in South Korea is still lacking, and most of the investment entities are state-owned enterprises, and private enterprises invest less in South Korea. In order to ease the trade deficit with South Korea, Chinese government should encourage Chinese companies to go global, and provide...
policy support for Chinese companies to invest in South Korea, create a good policy environment for Chinese companies to invest and set up factories in South Korea. China can also obtain advanced foreign science and technology and management experience from it, and promote the reform and development of Chinese enterprises. Therefore, increasing direct investment in South Korea to promote the growth of Chinese enterprises is an important way to improve the trade deficit between China and South Korea and reduce China's trade imbalance with South Korea.

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