Revealed Comparative Advantage of Capital-Intensive Industry in China

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Abstract. We investigate the relationships between revealed comparative advantage of capital-intensive products and GDP per capita in China. With the two non-stationary sequence of global capital-intensive products exports, we constructed the error correction model with serial correlation, and found that revealed comparative advantage is a stable series by first difference while the GDP per capita is also first difference non-stationary data series. The revealed comparative advantage index are from 0.37 to 0.78, and revealed comparative advantage index and GDP per capita are with cointegrated. The result has showed that Chinese capital-intensive products maintained have not a competitive edge in world, especially it show a slight decline after the year of 2010.

Introduction

The relationship between revealed comparative advantage (RCA) and GDP per capita (PRGDP) of capital-intensive products is increasingly discussed globally. Some scholars in China argue the RCA of capital intensive industry has a competitive edge in the world, while other researchers did not agree with it. They argued that the RCA presently have an advantage in the labor intensive industry other than in capital intensive industry.

David Ricardo (1870) created the comparative advantage theory as against Adam Smith's absolute advantage theory. It has become one of the main methods in analyzing the trade profit by export trade in and out of a country. A century later, Sweden economist Heckscher and Ohlin provided the dominant theory of factor endowment theory. Later, Haberler (1933), Wassily W. Leintief (1933), Lerner (1932) have improved it. Posoner (1961) use Technology gap theory to explore the merit. Vernon (1966) discuss it by Product life cycle theory.

Paul Krugman (1972) created scale economy and trade theory. Micheal Port raised the competitive strategies, national strategy and advantages of competition. However Krugman reject that Port's view does not be applied in the angle of nations, only can be applied in firms.

Hong (1977) argued the trap of comparative advantag es. He insisted that the comparision of cost should be discussed within a country other than out of the country.

Leintief’s mothod of input-output model is a good way. However the basic data of materials is hard to get. So the Balassa (1965,1989) revealed comparative advantage index can be the reflection of trade advantages.

Analysis of these views is a comprehensive analysis of RCA and PRGDP of in-depth theoretical single-equation model. This paper summarizes the scholars research between RCA and PRGDP, and use error correction model, ECM, to explore the relationships.

The innovation of this paper is to use a longer time-series data quantitative analysis to improve the reliability and validity of the study, revise and improve some of the conclusions of previous studies.

The paper is organized as follows, the second part is a theoretical overview of the relationship between the RCA and PRGDP, the third part is the empirical analysis on Chinese RCA and PRGDP, the fourth part draw conclusions.
Theoretical Overview on the RCA and PRGDP

According to literature, the RCA is

\[
RCA_i = \frac{X_{ij}}{\sum_j X_{ij}} / \frac{\sum_i X_{ij}}{\sum_i \sum_j X_{ij}}
\]

(1)

\(X_{ij}\) is the export of capital-intensive products within a country; \(\sum_j X_{ij}\) is the total export of the country. \(\sum_i \sum_j X_{ij}\) is the export of capital-intensive products in the world. \(\sum_i \sum_j X_{ij}\) is the export of the whole world trade. This paper using ECM model is to analyze and to determine the correlation between RCA and PRGDP

Empirical Analysis of Capital-Intensive Product's RCA and GDP Per Capita in China

Models Construction

Basic Mode. First of all, we have established the basic money supply and stock price impact model

\[
\ln(RCA_t) = \alpha + \beta \ln(PRGDP_t) + \epsilon_t, \quad t = 1995, 1996, ..., 2014
\]

(2)

RCA is the reveal competitive advantage index, PRGDP is the GDP per capita in China.

Data Collection and Selection

The data are selected from the UN trade sources and Chinese Statistics Bureau. The type of product are goods and services. In this paper, we choose the goods data. The standards of goods are HS, SITC and BEC. We use SITC rev.3. For the rev.4, has a short period. The capital-intensive products are 5th category and 7th category of the goods. The dataset of GDP per capita in China are from database of Chinese Statistics Bureau.

Model Analysis and Testing

Serial Correlation Test of the Model: After regression of Model, We Obtained the Results.

\[
\ln(RCA_t) = -2.438452 + 0.257361 \ln(PRGDP_t) \\
t = -8.846347 \quad 7.108993 \\
P2 = 0.737371 \\
\text{Prob}(\Phi - \sigma_\text{statistic}) = 0.000001 \quad \Delta.\Omega = 0.136021
\]

(3)

Since the model containing the intercept, D.W test cannot be used. We use Q and LM tests. LM test results are in Figure 1:

<table>
<thead>
<tr>
<th>Breusch-Godfrey Serial Correlation LM Test:</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
</tr>
<tr>
<td>R-squared</td>
</tr>
</tbody>
</table>

LM statistics showed that at the 5% significance level it does not reject the null hypothesis which the residual series regression equation is serial correlation. So, the estimation results of the regression equation is invalid.

Again, we do the Q test, and test results are in Figure 1.
As can be seen, Q statistic P values are more than 5%, indicating that the 5% significance level, does not reject the null hypothesis, the presence of residual series model is not serial correlation.

When the test results do not reject the null hypothesis, level of significance, goodness of fit test and F statistics will be trusted.

**Unit Root Test on RCA and PRGDP:** In order to Obtain Intuitive Understanding, We First Draw Charts of Two Variables.

![Figure 2. Trend of RCA from the year 1995 to 2014 in China.](image-url)

![Figure 3. Trend of China's GDP per capita from the year 1995 to 2014 in China.](image-url)

It is clear that the graphs showed some trends. We judges that RCA has no clear trend. So, with unit root test, we have selected the intercept, no trend item unit root test. Analysis of results are in Table 2:

<table>
<thead>
<tr>
<th>Autocorrelation</th>
<th>Partial Correlation</th>
<th>AC</th>
<th>PAC</th>
<th>C-Stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>0.818</td>
<td>0.818</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td>0.609</td>
<td>-0.182</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td>0.326</td>
<td>-0.357</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td>0.082</td>
<td>-0.069</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td>0.134</td>
<td>-0.097</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td>-0.305</td>
<td>-0.145</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>7</td>
<td></td>
<td>0.461</td>
<td>-0.243</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>8</td>
<td></td>
<td>-5.562</td>
<td>-0.097</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>9</td>
<td></td>
<td>-0.546</td>
<td>0.082</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>10</td>
<td></td>
<td>-0.469</td>
<td>0.014</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>11</td>
<td></td>
<td>-0.362</td>
<td>-0.097</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>12</td>
<td></td>
<td>-2.224</td>
<td>-0.074</td>
</tr>
</tbody>
</table>

As can be seen, P = 0.0803, the test results showed, RCA sequence would accept the null hypothesis which is a non-stationary sequence. Further, we do the ADF test by first difference and second difference. We got $RCA \sim I(1)$.

Second, we will determine the condition of sequence of PRGDP.
It is clear that the graphs showed some trends. We judges that PRGDP has some trends. So, with unit root test, we have selected the intercept, no trend item unit root test. Analysis of results are in Table 3:

<table>
<thead>
<tr>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.589582</td>
<td>0.4646</td>
</tr>
</tbody>
</table>

As can be seen, P = 0.4646, the test results showed, PRGDP sequence would accept the null hypothesis which is a non-stationary sequence. Further, we do the ADF test by first difference and second difference. We got \( PRGDP \sim I(1) \).

**RCA and PRGDP's ECM Model.** Because RCA is a AR(1) sequence, PRGDP is also an AR(1) serials. The two variable series do have the same integer order, we can use the co-integration test. After the test, we found that RCA and PRGDP serials are co-integration.

We establish RCA and LC error correction model (ECM)
Firstly establish long-term equilibrium equation using the data of the year 1995 to 2014

\[
\ln(RCA) = k_0 + k_1 \ln(PRGDP) + u, t = 1,2,...,T
\]

(4)

So let residual series \( ecm_t = \hat{u}_t \), as the error correction term, the establishment of the following error correction model is

\[
\Delta \ln(RCA) = \beta_0 + \alpha ecm_{t-1} + \Delta k_1 \ln(PRGDP) + \epsilon
\]

(5)

After the estimation, the result of equation (3.4) is:

\[
\ln(RCA) = 0.079898-0.344039\ln(PRGDP) - 0.147211 ecm_{t-1}.
\]

By measurement result ECM regression equation, we find that RCA affected their development in the extent of 14.72%. LC is some weak. ECM reflects the size of the coefficient of deviation from the long-run equilibrium of readjustment. From 0.14 coefficient estimates we can see, when short-term fluctuations deviate from the long-term equilibrium, it will adjust the intensity of 0.14, make non-equilibrium state back to equilibrium.

**Conclusions**
Inspecting on Chinese revealed comparative advantage and GDP per capita, the results are: Chinese revealed comparative advantage is a stability sequence by first difference, while the GDP per capita is a non-stationary sequence. When the short-term fluctuations deviate from the long-run equilibrium, adjustment of the GDP per capita will be -0.167, and the level of revealed comparative advantage will be back to equilibrium slightly.

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