Has China's Resource-based Regions Improved in the GVCs Specialization?—Take Shanxi as an Example

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Abstract

How to evaluate the value-added acquisition and carbon emissions of a province, especially for resource-based provinces, in the GVCs is still a problem worth solving. By embedding the world input-output table of Chinese provinces and using the decomposition method of GVCs, we comprehensively measured the value-added and carbon emissions of Shanxi Province, a resource-rich province in China. The results show that from 2002 to 2012, the value-added carbon emissions imports and exports of Shanxi have been growing rapidly, which are mostly achieved through direct imports and exports of intermediate products or through other provinces in China. And we combined value-added with carbon emissions to build an environmental inequity index model, and found that in the GVCs, the profitability of Shanxi actually deteriorated.

Keywords: global value chains, resource-based areas, value-added export, carbon emissions export, environmental inequity

1. Introduction

Resource-based regions are those whose development mainly depends on the exploitation of natural resources[1]. Despite the outstanding endowment of resources, the resource-based areas have been facing the problem of resource curse[2]. How to achieve sustainable development in such areas is the concern of governments[1,3,4]. China has a large number of resource-based areas, and the Chinese government has long been committed to promoting the sustainable development of these areas.

In the meantime, with the development of infrastructure and communication technology, the international division has been deepened continuously. Global value chains (GVCs) specialization has become a new normal of international division[5,6]. And resource-based regions are inevitably involved in the GVCs specialization. Therefore, how to achieve sustainable development of resource-based areas also needs to be considered from the perspective of GVCs.

In recent years, with the deepening of the GVCs specialization, the research on this area has become increasingly active. So far, the analysis of value-added exports and carbon emissions exports based on GVCs has become a hot topic for many scholars[7–9]. Compared with the existing research, there are several significant differences in this paper. Firstly, we embed Chinese provinces into the global input-output(I-O) table, build a new global I-O table, and delve into the issue of GVCs division about a certain region in China. Secondly, we thoroughly researched the profits and carbon emissions of domestic regions participating in the division of GVCs and fills this gap. Thirdly, in this paper, the real situation of resource-based regions in the GVCs specialization can be more accurately reflected by measuring the benefits and carbon emissions of domestic regions in the GVCs and building an

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Nomenclature

Abbreviation
ICEEE International Conference of Energy, Ecology and Environment
IEA International Energy Agency

Symbols
2019 Year

Subscript
3 3-th time step
environmental inequity index. And we take Shanxi Province as a case to study, which is a typical representative of China’s resource-based province.

2. paper structure

2.1 Subdivision - numbered sections

The following part of this paper includes several aspects: 2.2 Introduction, 2.3 Research Methods, 2.4 Data Sources, 2.5 Results, 2.6 Discussion, 2.7 Conclusions.

2.2 Introduction

Resource-based areas have been facing the problem of resource curse. China has a large number of resource-based areas, and the Chinese government has been committed to promoting the development of resource-based areas. With the development of globalization, global value chains (GVCs) has become the main way of global division of labor, and resource-based regions are inevitably involved in the GVCs specialization. Has China’s resource-based regions’ situation improved in the GVCs? We will take Shanxi as an example to carry out research.

2.3 Research Methods

Following the recent GVCs literature, we established a method for estimating the value-added and carbon emissions import and export from a domestic region participating in the GVCs specialization. Assuming that there are two Chinese provinces (s, w) and two foreign countries (H, R), each country or province has N sectors, the input-output relationship model can be expressed in Table 1.

Value added of regional s exports to all countries can be obtained:

\[ VA^s = \dot{V}^s B^s Y^s + \dot{V}^s C^s B^{sR} Y^{sR} + \dot{V}^s C^s B^{sT} Y^{sT} + \dot{V}^s C^s B^{sU} Y^{sU} \]  

The added value of region s imports from all countries:

\[ VA^s = \sum_{R} \sum_{G} \dot{R}^G B^{RS} Y^{RS} + \sum_{R} \sum_{u} \dot{R}^u B^{RU} Y^{RU} \]  

The net value added export of region s:

\[ netVA^s = VA^s - VA^s = \sum_{R} (VA^{SR} - VA^{RU}) \]  

The same method can also be used to calculate the carbon emissions exported and imported by region s to all countries:

\[ CE^s = \dot{C}^s B^s Y^s + \dot{C}^s C^s B^{sR} Y^{sR} + \dot{C}^s C^s B^{sT} Y^{sT} + \dot{C}^s C^s B^{sU} Y^{sU} \]  

\[ CE^s = \sum_{R} \sum_{G} \dot{R}^G B^{RS} Y^{RS} + \sum_{R} \sum_{u} \dot{R}^u B^{RU} Y^{RU} \]  

\[ netCE^s = CE^s - CE^s = \sum_{R} (CE^{SR} - CE^{RU}) \]  

According to the value added and carbon emissions of region s in the GVCs, the environmental inequity index is constructed to express the relationship between net value-added export and net carbon emissions export.

\[ NCY^{SR} = netCE^{SR}/netVA^{SR} \]  

2.4 Data Sources

In this study, the interregional input-output tables of China in 2002, 2007 and 2012 were compiled by Li Shantong et al[10–12]. Referring to Meng et al. (2013)[13], the interregional input-output tables of China were linked with WIOT tables.

Carbon emissions data of 14 countries and regions in 2002 and 2007 is from WIOT, and the data in 2012 is derived from Mi et al. (2017) method[14].

2.5 Results

2.5.1 Value-added Import and Export in Shanxi

From the total amount of accounting, the value-added imports and exports of Shanxi in the process of participating in the division of global value chain from 2002 to 2012 have maintained a high growth trend, indicating that Shanxi’s participation in the division of global value chain has gradually increased. But Shanxi’s profitability in the global value chains is far less than that of the eastern coastal provinces. Shanxi achieves value-added export mainly through the coastal provinces to participate in the division of GVCs indirectly, providing raw materials for the coastal provinces to participate in the division of GVCs.

2.5.2 Carbon Emissions Import and Export in Shanxi

The import and export of carbon emissions in Shanxi Province have maintained a rapid growth, but the total import volume is still far lower than the total export volume. mainly come from resource-based industries.

2.5.3 Environmental Inequity

Based on the environmental equity index, the situation of China’s provinces participating in the division of GVCs can be divided into three categories. The study finds that Shanxi’s situation in the participation of GVCs division deteriorated, while the situation of eastern coastal provinces improved.

2.6 Discussion

The main reason for Shanxi’s worsening situation in GVCs division is that it mainly benefits from resource-based industries, but less from manufacturing and service industries. And the profitability of every industry is getting worse.
2.7 Conclusions

From 2002 to 2012, Shanxi Province’s ability to gain profits from the division of labor in the global value chain deteriorated, resulting in losses in actual benefits, while the cost of carbon emissions assumed was gradually increasing.

Shanxi’s value-added export and carbon emission export are realized by resource-based industries. The eastern coastal provinces are the areas through which Shanxi Province exports. Shanxi Province’s dependence on these areas is still increasing.

Shanxi, as a resource-based province, is deteriorating in the global value chain. Compared with processing and service-oriented provinces, Shanxi is in a more unfair position. The state needs to re-examine and formulate Shanxi’s economic development policy to help Shanxi out of the dilemma of resource economy transformation.

2.8 References

2.8.1 Citation in text

Resource-based cities are those whose development mainly depends on the exploitation of natural resources. Resource-based regions have been facing the problem of resource curse. Global value chains have become a new normal of international division.

2.9 Tables

Table 1. World Input-Output Table Embedded in Chinese Provinces

(2 Countries and 2 Provinces)

<table>
<thead>
<tr>
<th>Intermediate demand</th>
<th>Final demand</th>
<th>Total Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>R</td>
<td>s</td>
</tr>
<tr>
<td>Z_{H}</td>
<td>Z_{R}</td>
<td>Z_{s}</td>
</tr>
<tr>
<td>Z_{R}</td>
<td>Z_{s}</td>
<td>Z_{w}</td>
</tr>
<tr>
<td>Z_{s}</td>
<td>Z_{w}</td>
<td>Y_{H}</td>
</tr>
<tr>
<td>Z_{w}</td>
<td>Y_{H}</td>
<td>Y_{R}</td>
</tr>
<tr>
<td>Value added</td>
<td>VA_{H}</td>
<td>VA_{R}</td>
</tr>
<tr>
<td>Total Input</td>
<td>(X_{H})'</td>
<td>(X_{R})'</td>
</tr>
</tbody>
</table>

2.10 Figures

Figure 1 Exports of goods and services, value-added imports and exports and net exports of Shanxi Province (2002-2012)

Figure 2 The distribution of value-added exports in Shanxi Province (2002-2012)

Figure 3 Import and export status of carbon emissions in Shanxi Province (2002-2012)
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Reference


