Can the Silk Road Economic Belt Alleviate Economic Inequality in Countries Along the Route?

Ziyi Ling

University of Michigan, 500 S State St, Ann Arbor, MI 48109, USA
ziyi.annie.ling0910@gmail.com

Abstract. The Belt and Road Initiative has achieved great success since it was proposed in 2013, providing many opportunities for the economic development of the countries along the route. The Silk Road Economic Belt has been effective and helpful in promoting the economic development of developing countries, consolidating the position, and increasing the competitiveness of the countries along the route in the international market, and alleviating the wealth gap. This paper constructs a multidimensional index system for measuring economic inequality and measures the extent of economic inequality of 20 countries along the Silk Road Economic Belt from 2010 to 2019 by using the entropy value method. This paper analyzes the impact of the Silk Road Economic Belt on the economic inequality of the countries along the route as well as the mechanism behind. The results show that the Silk Road Economic Belt achieves greater effect on alleviating economic inequality in countries in the European region than in Asian countries. Lastly, based on the findings of the study, the paper provides policy recommendations for the countries along the Silk Road Economic Belt.

Keywords: The Silk Road Economic Belt, economic inequality.

1 Introduction

President Xi proposed “The Belt and Road Initiative” in 2013. The Silk Road Economic Belt and Maritime Silk Road connected 131 countries and established multiple economic and trade cooperation zones. While helping China to find trade partners, The Belt and Road Initiative has created development opportunities for developing countries to improve its infrastructure and attract investment, narrowing the gap in economic gains between countries due to trade structure, natural endowment, production technology and other reasons. The 20th National Congress of the Communist Party of China (CPC) [1-15] emphasized the important role of the Belt and Road Initiative in China's economic and trade development, and President Xi's proposal of the Belt and Road Initiative as an international platform for cooperation has made considerable progress. For example, the trade volume between China and the five Central Asian countries and ASEAN has increased by more than 100 times in the past two decades, which has pro-

K. Zhang et al. (eds.), *Proceedings of the 2024 3rd International Conference on Economics, Smart Finance and Contemporary Trade (ESFCT 2024)*, Advances in Economics, Business and Management Research 305,
https://doi.org/10.2991/978-94-6463-548-5_15

moted the economic development of multilateralism and promoted the process of globalization[1]. President Xi also proposed to continue to promote the construction of key infrastructure projects and the development of poverty alleviation in developing countries under the "Belt and Road" initiative. (Bi et al., 2021) analyze that the Belt and Road Initiative has reduced the income gap between co-built and non-co-built countries by an average of 8.9%, confirming the positive economic impact of the Belt and Road Initiative on the participating countries. (He et al. 2014 applied the theory of physical capital and human capital to explain the close connection between physical capital and human capita, and how human and physical capital can improve the efficiency of social production and alleviate economic inequality, proving that the Belt and Road Initiative has increased human resources in participating developing countries, which is conducive to reducing the economic inequality between countries. This paper will discuss in depth the impact of the Silk Road Economic Belt on the five major aspects: national development level, infrastructure, science and education level, political efficiency level, and sustainable development, as well as the role of these factors in improving economic inequality. In addition, this paper constructs a new multidimensional index system for measuring economic inequality, which provides a relatively comprehensive measurement basis for future scholars to study economic inequality. This paper collects the economic inequality data of 20 countries participating in the Silk Road Economic Belt from 2010 to 2019, and analyzes the impact of the Silk Road Economic Belt on the economic inequality [2-8] of the countries along the route, as well as the mechanism of its effect. The topics studied in this paper has great practical significance for the countries along the Silk Road Economic Belt to adjust their resource endowment and formulate international policies.

2 Literature Review

Global scholars have conducted a large number of studies on the Belt and Road Initiative. The main research includes four aspects: the characteristics and differences of China's trade with different regions under the Belt and Road Initiative, the risks and challenges faced by the Belt and Road Initiative, the social macro-impact of the Belt and Road Initiative on developing countries, and the impact and inspiration of the Belt and Road Initiative on the participating countries in one aspect or another.

Firstly, many scholars in trade research related to the Belt and Road Initiative have proved that trades have unequal impact on countries. (Zou et al., 2015) analyzed the trade dependence between China and the countries along the “Belt and Road” and showed that the export trade between China and Mongolia and Russia contributed little to GDP growth, while the trade with 11 East Asian countries stimulates large GDP growth. (Zhang et al., 2015) proved from the perspective of trade facilitation that the growth of GDP in Central Asia and Arab countries has the most obvious effect on promoting international trade. The low GDP level [3-9] and simple industrial structure of

[1] The data is from Belt and Road Portal: yidaiyilu.gov.cn

countries in Central Asia have led to a high marginal effect of GDP growth in promoting trade exchanges. However, the growth of FDI has a significant impact on trade promotion in East Asia and Southeast Asia and has little impact on Europe. (Sun et al., 2017) explored from the perspective of product homogeneity and heterogeneity and proved that the Belt and Road initiative has a more significant impact on the export of heterogeneous products. (Han Yonghui, 2015), (Zou Jianhua, 2014) and others (Zou et al., 2014) pointed out that the resource endowment and industrial structure of China and West Asia are the most complementary in the Belt and Road initiative, so the Belt and Road"has great impact on West Asia. (Gong et al., 2015) studied the transformation of the international trade pattern in the Belt and Road initiative and found that many countries have changed from traditional comparative advantages to competitive advantages. Beside, the trade volume between various provinces and different regions in China are different. (Sang et al., 2015) pointed out from the perspective of trade complementarity and competitiveness that China's trade with Western Europe, South Asia, Central Europe and other regions is highly complementary and has great development potential.

Secondly, many scholars have studied the challenges and risks of the Belt and Road Initiative from the perspectives of investment and geopolitical conflicts. (Zheng Lei, 2015) and (Zhou WuQi, 2015) analysed the challenges China encounters when investing in countries participating in the Belt and Road Initiative from the perspectives of geopolitical relations, religion and culture, uneven investment development, and strong strategic investment barriers. In her study, (Jin Ling, 2015) illustrated the potential risks posed by the great power game (China, the United States, and Russia) for the Belt and Road Initiative. (Pitlo, 2015) and (Jacob Stokes, 2015) both pointed out in their studies that the Belt and Road Initiative is intended to make China the center of world power, reaffirming the political conflict that exists between China and the United States. (Wang et al., 2018) suggest that fluctuations such as anti-globalization have limited China's direct investment in developing countries participating in the Belt and Road Initiative. (Zhao et al., 2017) suggest that the internationalization of the RMB as a result of the Belt and Road Initiative has triggered political conflicts among great powers. (Acensao, 2018) and (Coenen et al., 2021) criticize the negative impacts of the Belt and Road Initiative on the global environment. (Hurley et al., 2019) investigate and assess the risk of debt distress in Belt and Road Initiative borrowing countries.

3 Analysis of Economic Inequality in Countries Along the Silk Road Economic Belt

3.1 Construction of the Multidimensional Index System

The five links of the Belt and Road initiative are: policy coordination, infrastructure development, investment and trade facilitation, financial integration, and cultural and social exchange, which reflect the diversification of the Belt and Road initiative policy. The relevant projects of the initiative include infrastructure construction for developing

countries, including the joint steel project invested and constructed by China in Malaysia in November 2016, and the construction of the Karot Hydropower Station in Pakistan. In addition, the Belt and Road initiative also pays attention to the education development, the reconstruction project of 113 hut primary schools in Burkina Faso will be completed in 2020. The Belt and Road initiative has promoted the development of developing countries in many ways, which is in line with the existing economic theory.

Schools of classical economics, welfare economics, and new institutional economics analyzed the factors of economic inequality from different perspectives. Therefore, corresponding with the multi-faceted construction implemented in the Belt and Road initiative, this paper constructs a comprehensive index system to measure the impact of the Silk Road Economic Belt on participating countries from five aspects: national development level, infrastructure, science and education level, political efficiency level, and sustainable development.

3.2 Source of Data

The original number of countries along the Silk Road Economic Belt this paper want to investigate is 22[2]. However, due to limited availability of certain data, this paper selects 20 countries and deletes two countries, Uzbekistan and Algeria. The 2010-2019 data of the 20 countries studied in this paper are all obtained from the World Bank public database. Data about irregular payments and bribes, judicial independence, and efficiency of legal framework in setting disputes from 2010-2019 are from The Global Competitiveness Report.

3.3 Research Method and Calculation Process

This paper uses the entropy value method to process the collected data. Entropy value is an objective assignment method which determines the indicator weights based on the magnitude of the information provided by each observation. Therefore, the indicator weights measured using the entropy value method have higher credibility and accuracy than the subjective assignment method. The economic inequality index constructed by the entropy value method in this paper has high accuracy and can be used to explain the impact of the Silk Road Economic Belt on the economic inequality of the countries along the route from 2010 to 2019.

The steps of measuring the economic inequality of the countries along the Silk Road Economic Belt using the entropy method can be roughly divided into the following steps: standardization of data, calculation of the weight of indicators, calculation of entropy, calculation of the coefficient of variation, calculation of the weight, and calculation of the final value.

[2] List of countries along the Silk Road Economic Belt: Kazakhstan, Turkey, Russia, Israel, Ukraine, Lithuania, Romania, Bulgaria, Armenia, Georgia, Slovenia, Latvia, Hungary, Czech Republic, Poland, Belgium, France, Austria, Germany, Netherlands

3.4 Standardization of Data

Standardization of data helps to simplify the calculation process of the entropy method. The value and sign of the original data are cases of incomparability between groups. For example, the data of Gini index is in the range of 20-50, while the data of air transportation volume varies from 0-800000. And the total net trade of some countries is negative. Therefore, in order to eliminate the influence of the differences in data outline and order of magnitude on the evaluation results, it is necessary to standardize the raw data, as shown in formula (1) and formula (2).

Formula for standardization of positive data is

$$X'ij = \frac{Xj - Xmin}{Xmax - Xmin} \tag{1}$$

where $X'ij$ represents each of the tertiary indicators, $Xmin$ represents the minimum value in each of the tertiary indicators, and $Xmax$ represents the maximum value in each of the tertiary indicators.

Formula for standardization of negative data is:

$$X'ij = \frac{Xmax - Xj}{Xmax - Xmin} \tag{2}$$

This formula calculates the difference between each value of tertiary indicator and the maximum value of that tertiary indicator, then divided the value by the difference between the maximum and minimum value.

3.5 Calculation of the Weight of Each Indicator Pij

The purpose of the indicator weighting calculation is to clearly compare the weighting of the tertiary indicators in terms of the primary indicators, as shown in its specific formula (3):

$$Pij = \frac{Xij}{\sum_{i=1}^{m} Xij} \tag{3}$$

Formula (3) solves for the jth indicator Pij under program i by first summing all Xij values (the raw data for the tertiary indicators) and then dividing each individual Xij value by the sum of the Xij values. Pij represents the weight of each tertiary indicator in the tertiary indicators.

3.6 Calculation of Entropy ej

$$ej = -k \sum_{i=1}^{m} Pij \ln Pij \tag{4}$$

Formula (4) is the synthesized result of the above. The value k is calculated first with the formula $k = \frac{1}{\ln m}$, which represents the weight of the sum of dimensions of the indicator system constructed in this paper. The entropy value ej represents the weight of each third-level indicator to the first-level indicator.

3.7 Calculation of the Coefficient of Variation gj

The coefficient of variation in the entropy method is used to compare the degree of fluctuation between the three levels of indicators, and its specific formula is shown in equation (5).

$$gj = 1 - ej \tag{5}$$

3.8 Calculation of the Weight wj

$$wj = \frac{gj}{\sum_{j=1}^{m} gi} \tag{6}$$

Formula (6) represents the weights of each secondary indicator in the index system. First, find the sum of all the coefficients of variation gj, and then the weight wj is obtained by dividing each individual value of coefficient of variation gj by the sum of the values of gj.

3.9 Calculate the final value-Economic Inequality Index

Finally, the economic inequality index of the Silk Road Economic Belt is obtained by summing up the previously calculated weights wj with the indicator weights Pij. The specific calculation process is shown in equation (7).

$$sj = \sum_{j=1}^{m} wj \times Pij \tag{7}$$

4 Analysis of the Calculation

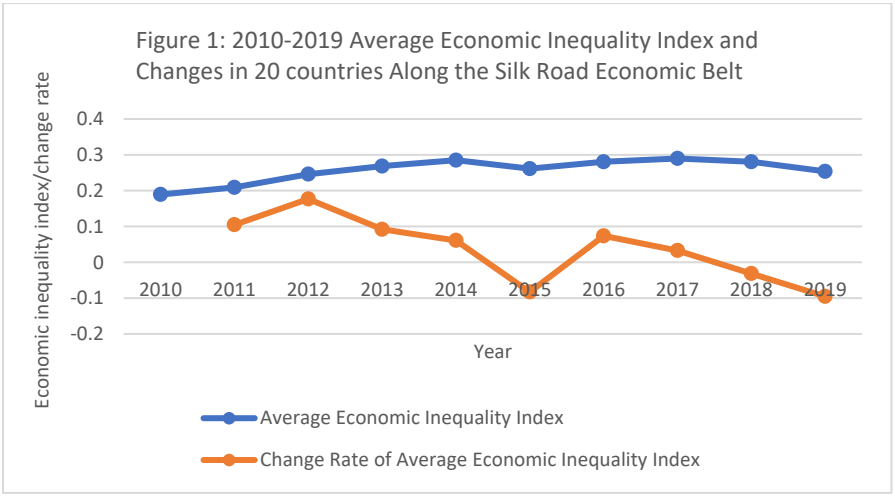

Fig. 1. Average Economic Inequality Index and Changes in 20 countries Along the Silk Road Economic Belt.

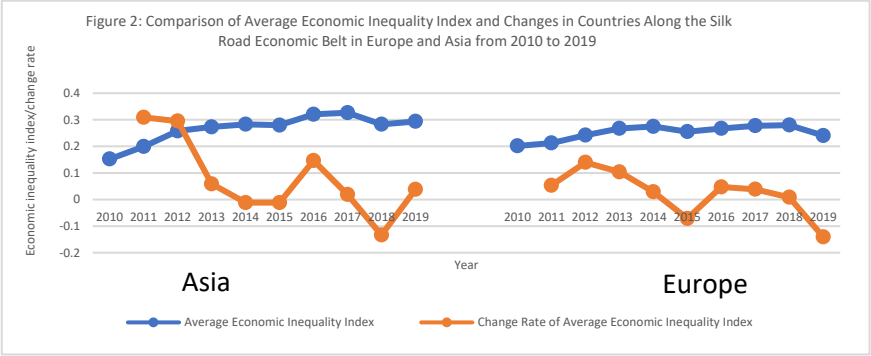

Fig. 2. Comparison of Average Economic Inequality Index and Changes in Countries in Europe and Asia

5 Conclusion

The average economic inequality index of the 20 countries along the Silk Road Economic Belt continued to grow from 2010 to 2014, and the increasing growth trend showed a straight slope (as shown in Figure 1 and 2). The average index of economic inequality fell in 2014-2015. The growth trend of the average economic inequality index from 2015 to 2019 is a downward opening curve shape, the growth rate of the economic inequality index from 2015 to 2017 decreases, and the economic inequality index declines after 2017. Analyzing the average economic inequality index of these 20 countries from the perspective of the degree of change in the index, the growth of economic inequality was greater before 2014 and smaller after 2016. As seen in the two lines in the graph shown above, 2014 is an important point in the change of economic inequality, which is consistent with the time period in November 2013 when the Third Plenary Session of the 18th CPC Central Committee clarified the construction of the Silk Road Economic Belt and the related plans.

Since the Silk Road Economic Belt was proposed, large-scale projects such as the China-Central Asia gas pipeline, the China-Pakistan Economic Corridor, and the construction of the port of Gwadar in Pakistan have been carried out one after another, which have facilitated trade between countries and increased factors of production in countries along the Silk Road Economic Belt. It is worth noting that the Asian Infrastructure Investment Bank was established in 2015 and officially began operations in 2016, supporting infrastructure construction projects in more than 30 countries in just a few years, increasing material capital for countries along the Silk Road Economic Belt. The Silk Road Economic Belt has been developed to provide development opportunities and platforms for poor developing countries. The Silk Road Economic Belt program addresses differences in resource endowment and industrial structure and mitigates economic inequalities caused by unequal opportunities. In addition, the Silk Road Economic Belt promotes cultural and technological exchanges and trade among countries and provides some backward developing countries with technological innovation and institutional change, as well as economic development opportunities.

Funding Project

Subject classification codes: F753;F282.

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