An Analysis of the Economic Effects of Trade Facilitation in the Construction of Belt and Road: A Simulation Study Based on GTAP Model

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Abstract. In recent years, "Belt and Road" has become a hot spot in international trade because of its large number of participating countries and extensive regional coverage. Firstly, 4 first-class indicators and 26 s-class indicators are set up to study the constraints of trade facilitation and the proportion of each factor in the countries along the "Belt and Road" based on principal component analysis. Secondly, GTAP model is used to simulate the trade and economic effects of tariff reciprocity and non-tariff barriers reduction between China and the regions along the Belt and Road. Finally, according to the simulation results analysis and put forward the corresponding policy recommendations: the countries along the "Belt and Road" should focus on improving non-tariff barriers to trade; improve the business environment in countries along the "Belt and Road" and promote free trade; promote industrial complementarity among the countries along the belt and road and tap the potential of trade cooperation.

Keywords: Tariff reciprocity · Trade facilitation · Economic effects · GTAP model

1 Introduction

In 2013, General Secretary Xi Jinping proposed cooperation initiatives for the construction of the "New Silk Road Economic Belt" and the "21st century sea route of Silk Road," building on the existing bilateral and multilateral mechanisms between China and relevant countries, with the help of the established and effective regional cooperation platform, the aim is to develop actively economic partnership with the countries along the route. This move has received a positive response from more and more countries, especially developing countries.

However, at present, the international situation is complicated, and "non-efficiency of trade", as a kind of market barrier, has hindered the international trade activities of all countries, so it is increasingly important to enhance the level of trade facilitation and promote the trade development of all countries. There is a big gap in the level of trade facilitation between developing countries, we should study the level of trade facilitation between China and the "Belt and Road" countries and strengthen mutual trade cooperation, it is of great importance and practical significance for better promoting trade exchanges between various parties.

2   Literature Review

In the background of trade protectionism, it is very important to promote and study trade facilitation. In the evaluation system of trade facilitation, the most representative is Wilson (2003), he selected four first-level indicators, such as port efficiency, system environment, customs environment and e-commerce, other scholars use and expand the indicator system. Liu Jun and Zhang Yabim (2016) singled out financial services as a primary indicator to highlight their important role in modern international trade. The empirical analysis of Portugal (2012) showed that trade facilitation can significantly promote the export growth of developing countries, and the trade promotion effect of infrastructure quality is the largest.

Most scholars use gravity model to analyze the impact of trade facilitation on trade flows, Dong Hinge analyzed 69 countries along the "Belt and Road" and concludes that trade facilitation plays the most important role in promoting international trade based on the extended gravity model. Xia Juan and Yue Jing (2011), Fang Xiaoxia and Zhu Mingxia (2013) also used gravity models to analysis the impact of trade facilitation on the total volume of trade between China and ASEAN. Some scholars also use GTAP model to analyze the impact of trade facilitation on trade flows. Hanson (2019) used the GTAP model as a research tool to simulate and calculate the economic impact of trade facilitation on the SCO member states on the basis of a 30% reduction in the time cost of trade.

Firstly, the paper calculates the trade facilitation level of the countries along the "Belt and Road", and then uses the GTAP model to simulate how the promotion of trade facilitation level affects the macro-economy, trade and different industries of the countries along the routes Finally, according to the research results, the paper provides policy suggestions on how to promote the trade facilitation level of the countries along the "Belt and Road".

3   Measurement of Trade Facilitation Level of the Countries Along the Belt and Road

3.1   Construction of Indicator System

Based on the basic ideas of Wilson (2003), the relevant rules of the agreement on trade facilitation and the characteristics of the trade development of the countries along the "Belt and Road", four primary indicators were selected, namely, infrastructure and logistics quality, customs environment, regulatory environment, e-commerce and financial environment, and 26 secondary indicators were established under the primary indicators (Table 1). The 26 secondary indicators included in this paper are derived from the global competitiveness report (GCR), the global trade facilitation report (GETR) and the Global Information Technology Network Development Report (GITR).

Because the data of the secondary indicators come from different reports, the range of their values is different, which is not conducive to comparison. In order to make the indicators comparable, this paper uses the global competitiveness report for reference to process the data, that is, fix the value range of each indicator in 1–7.

3.2 Determination of Index Weight

This paper uses SPSS software to carry out principal component analysis of the data, firstly carries on the test of KMO and Bartlett, the test result shows that the KMO test coefficient value is greater than 0.8, the significance is 0, it shows that principal component analysis method is suitable for analysis. According to the results of principal component analysis, the factor greater than 1 in the eigenvalues was extracted., four principal components were selected, and 81.1% of the information was extracted.

According to the Table 1 and the contribution rate of principal component, the model is further normalized, the weights of four primary indicators can be calculated: Infrastructure and logistics quality (A)is 0.3411, customs environment (B)is 0.1780, regulatory environment (C)is 0.2881, e-commerce and financial environment (D)is 0.1929.

Table 1. Indicator system for trade facilitation

Primary Index	Secondary Index	Weight	Scoring range	Data source
Infrastructure and logistics quality (A)	Quality of port infrastructure	0.04	1–7	GCR
	Quality of aviation infrastructure	0.04	1–7	GCR
	Quality of railway infrastructure	0.03	1–7	GCR
	Quality of highway infrastructure	0.05	1–7	GCR
	Loading capacity	0.04	1–7	GETR
	Logistics Capability	0.05	1–7	GETR
	Tracking and tracking capabilities	0.05	1–7	GETR
	Information technology related regulations	0.04	1–7	GETR
Customs Environment (B)	The prevalence of non-tariff barriers to trade	0.02	1–7	GCR
	Complex tariff	0.03	1–7	GETR
	Trade Tariff	0.02	1–7	GCR
	Efficiency of customs procedures	0.04	1–7	GETR
	Efficiency and transparency	0.01	0–1	GETR
	Irregular payments and bribes	0.05	1–5	GETR

Table 1. (*continued*)

Primary Index	Secondary Index	Weight	Scoring range	Data source
Regulatory Environment (C)	Efficiency of the legal system	0.06	1–7	GITR
	Whether the law is strictly enforced	0.06	1–7	GCR
	The burden of government regulation	0.04	1–7	GCR
	Transparency in government policy	0.04	1–7	GCR
	Judicial independence	0.06	1–7	GCR
	The business cost of crime and violence	0.02	1–7	GCR
Electronic Commerce and financial environment (D)	E-commerce usage	0.02	1–7	GITR
	Availability of new technologies	0.03	1–7	GCR
	The absorption of new technology	0.04	1–7	GCR
	Costs of financial services	0.04	1–7	GCR
	Availability of financial services	0.04	1–7	GCR
	Accessibility of financial services	0.03	1–7	GCR

4 Empirical Analysis

4.1 Model Selection

This paper uses the global trade analysis model (GTAP) to analyze the economic effects of trade facilitation on countries along the "Belt and Road". According to the purpose and object of this paper, the original countries of GTAP model are divided into 11 groups, they are China, Mongolia, West Asia, South Asia, Central Asia, Southeast Asia, central and Eastern Europe, Oceania, Latin America, Africa and other countries and regions. In terms of impact variables, this paper uses TMS and AMS to represent changes in tariff barriers and non-tariff barriers to trade.

4.2 Simulation Scheme

The article sets the following six scenarios.

Scenario 1: Unified tariff reduction of 10% for countries along the "Belt and Road";

Scenario 2: Unified tariff reduction of 50% for countries along the "Belt and Road";
scenario 3: Unified tariff reduction of 100% for countries along the "Belt and Road";
Scenario 4: The trade situation of the countries along the "Belt and Road" has improved, with a 5% decline in non-tariff barriers to trade;
Scenario 5: The trade situation of the countries along the "Belt and Road" has improved, with a 10% decline in non-tariff barriers to trade;
Scenario 6: Tariff and terms of trade of the countries along the "Belt and Road" are improved; tariff levels are reduced uniformly by 100% and non-tariff barriers to trade by 10%.

4.3   Analysis of Simulation Results

The declines of tariff barriers and non-tariff barriers to trade have contributed to a rise in China's GDP, particularly at the non-tariff barriers to trade. The decline of tariff barriers has a limited effect on the growth of GDP in China, while the decline of non-tariff barriers to trade has a strong effect on the growth of GDP in China. This is because, in recent years, the level of tariffs between the countries and regions along the line has already been at a lower level, the improvement of the non-tariff barriers to trade still has greater room for improvement, so the pull effect is more obvious (Table 2).

The further improvement of trade barriers between the regions along the "Belt and Road" will raise their social welfare level, which is the biggest because of China's large base. The benefits of TMS were significantly lower than those of AMS, and the benefits of TMS were significantly higher than those of non-tariff barriers to trade.

In addition to China, the welfare level of the 18 countries in West Asia, 10 countries in Southeast Asia and 8 countries in South Asia has increased relatively. In short, the cooperation among the "Belt and Road" countries should not only advocate the

Table 2. Changes in GDP (Unit: %)

Region	One	Two	Three	Four	Five	Six
china	0.08	0.39	0.79	0.90	1.81	2.60
Mongolia	0.03	0.15	0.30	4.73	9.47	9.76
Western Asia	0.04	0.18	0.36	0.95	1.90	2.26
South Asia	0.04	−0.21	−0.41	1.51	3.03	2.26
Central Asian	0.04	0.19	0.38	2.38	4.76	5.14
Southeast Asia	0.12	0.58	1.16	2.04	4.07	5.24
eastern European	0.02	0.09	0.17	0.77	1.53	1.70
Oceania	−0.03	−0.14	−0.29	−0.39	−0.79	−1.08
Latin America	−0.01	−0.07	−0.14	−0.22	−0.43	−0.57
Africa	−0.02	−0.11	−0.22	−0.36	−0.73	−0.94
Other countries	−0.02	−0.11	−0.23	−0.32	−0.63	−0.86

Table 3. Changes in benefits(Unit: Millions of dollars)

Region	One	Two	Three	Four	Five	six
china	1009.4	5047.34	10094.	21697	43395.75	53940
Mongolia	1.49	7.46	14.91	138.58	277.17	292.08
Western Asia	774.52	3872.61	7745.2	14800	29601.74	37346
South Asia	471.40	2358.51	4717.0	13058	26091.85	30808
Central Asian	46.05	230.26	460.51	2247.7	4495.52	4956
Southeast Asia	627.96	3139.78	6279.5	16616	33232.58	39512
eastern European	173.35	866.74	1733.4	9179.6	18395.37	20092
Oceania	−58.64	−293.18	−586.3	−1061	−2123.19	−2710.
Latin America	−23.30	−116.51	−233.0	−1014	−2028.19	−2261
Africa	−53.85	−269.26	−538.5	−1621	−3242.78	−3781
Other countries	−1574	−7873.48	−15746	−22307	−44615.7	−60362

Table 4. Changes in terms of trade (Unit: %)

Region	One	Two	Three	Four	Five	Six
china	0.04	0.21	0.42	0.27	0.55	0.97
Mongolia	0.04	0.21	0.42	3.20	6.41	6.82
Western Asia	0.06	0.29	0.58	0.69	1.39	1.96
South Asia	−0.09	−0.44	−0.88	0.46	0.91	0.03
Central Asian	0.04	0.18	0.36	1.66	3.33	3.68
Southeast Asia	0.05	0.25	0.50	0.54	1.08	1.58
eastern European	0.01	0.05	0.11	0.23	0.45	0.56
Oceania	−0.03	−0.13	−0.26	−0.43	−0.85	−1.12
Latin America	0.00	−0.02	−0.05	−0.10	−0.21	−0.25
Africa	−0.01	−0.05	−0.09	−0.29	−0.59	−0.68
Other countries	−0.02	−0.08	−0.15	−0.18	−0.36	−0.51

implementation of policies to reduce tariff barriers, we should also pay attention to the implementation of the non-tariff barriers to trade policy in order to more effectively enhance the social welfare of all countries. (Table 3).

Table 4 shows that the terms of trade of the region along "Belt and Road" countries have increased in varying degrees. South Asia's terms of trade have deteriorated in the face of falling tariff barriers. This is because South Asia's terms of trade have been affected by lower relative prices of exports, a lower increase in exports to China than imports, and a higher dependence on imports from China in South Asia.

5   Conclusion

The reduction of tariff barriers and non-tariff barriers to trade among the Belt and Road countries can create opportunities for economic and trade cooperation. Besides South Asia, the change of GDP in the other affected regions has a positive impact. At the same time, the improvement of trade barrier makes the welfare level of the impacted area improve in different range, especially in China, the benefit effect is most obvious. In addition, GDP, social welfare and terms of trade outside the Belt and Road countries have been negatively affected to some extent.

As the level of tariff barriers in the countries under the "Belt and Road" initiative is already relatively low, the effect of tariff barriers is relatively limited, and the improvement of the non-tariff barriers to trade is of great significance to the economic and trade cooperation of all countries and has greater room for improvement, the level of GDP, social welfare and terms of trade in China and the affected regions have all been greatly improved. This shows that the "Belt and Road" policy is not only beneficial to China, but also can create huge economic benefits for the countries along the route, which is also in line with China's concept of building a "Community of shared destiny".

First, the countries along the "Belt and Road" should focus on improving non-tariff barriers to trade, and work together to promote free trade and facilitation at the national and interregional levels. Including seeking mutual recognition with foreign certification and inspection bodies, strengthening the standardization of technical regulations and technical measures, as well as improving the efficiency of customs clearance ports and reducing unnecessary customs procedures, we will step up cooperation between customs and inspection departments.

Second, improve the business environment in countries along the "Belt and Road" and promote free trade. To promote regional cooperation among the countries along the belt and road, and to advocate the compatibility of standards systems among the countries so as to improve the policy and legal systems, and to do a good job in the elaboration and implementation as soon as possible, so as to provide policy and legal support for improving the business environment, this is conducive to the realization of win-win cooperation in the development situation.

Third, promote industrial complementarity among the countries along the belt and road and tap the potential of trade cooperation. The countries along the belt and road should give full play to their comparative advantages, improve their trade structure and promote their economic restructuring and upgrading. In basic industries, the countries along the route should do a good job of division of Labor, promote the optimal allocation of resources, expand cooperation in high-tech products, new energy and other areas besides basic industries.

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