Border Effect and Proximity Effect of Bilateral Trade Between China and Its Land Neighbors — Simulation Based on GTAP Mode

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Abstract: This paper is based on the study of the economic effects of the "six corridors" of China's 14 land neighbors in the "Belt and Road" initiative. A static GTAP model is used to assess the impact of stability and transport infrastructure capacity on the trade potential of China's land neighbors. The study found that the regions with higher stability as a whole have more developed imports and exports. my country's frontier growth is very likely to achieve economies of scale and industrial expansion, driven by policies that focus on improving the level of infrastructure construction.
***Keywords*:** transportation cost, infrastructure level, trade potential, GTAP model

1. Introduction and literature review

China's neighboring countries have always been prone to instability due to various reasons. The direct impact of these problems is the deepening of instability or random outbreaks of instability. Trade is highly sensitive to stability. China is the largest economic and trade volume in Asia. The largest country is also the country with the longest land border and the largest number of bordering countries. This is the basis for China to become a country with a central effect and a neighboring country effect. Zhu Zeyan (2020) analyzed the impact of RMB exchange rate changes on the bilateral trade of CAFTA countries, and believed that the growth of trade between neighboring countries is conducive to bilateral trade exchanges. In the short term, China and neighboring countries show small fluctuations in the same direction, and long-term competition is consistent, and confirmed that neighboring countries The existence of trade effects and central effects.

In frontier economic growth, trade development can optimize economic conditions, further promote stability, and make stability an important guarantee of continuity.Peter and Nora (2014) believe that border security has a role in promoting trade. Stability is manifested in the people living and working in peace and contentment, ethnic unity and harmony, and fair and effective mediation of civil conflicts and disputes. There are direct and indirect factors that lead to instability. Direct factors include wars, riots, and turmoil.

At present, there are not many studies on the stability and trade issues of my country's borders, and the relationship between stability and development is also unclear and difficult to distinguish. This article intends to explore the delicate relationship between stability and trade development from the perspective of economic costs. Therefore, this paper will use the improved computable general equilibrium model to introduce the unstable land trade and time costs into the measure of China's frontier stability and trade relations, and conduct a more accurate simulation of frontier stability and trade.

2. Simulation ideas and schemes

2.1 Selection of regions and sectors in the model

GTAP was developed by Purdue University professor Thomas W. Developed by the Global Trade Analysis Project (GTAP) led by Hertel, it is widely used in trade policy analysis. Data Basecycle is the basic database of GTAP. Considering that Tajikistan is included in the research object, the latest version is used. Added Tajikistan's GTAP V10 database (Gehlhar and McDougall, 2002). In total, the study area includes China's 21 land neighbors and 10 trade product sectors. These countries are North Korea, Russia, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Pakistan, Afghanistan, India, Bhutan, Nepal, Myanmar, Laos, and Vietnam. These trade sectors are divided into 9 categories, namely agriculture, mining, food, textile and leather, wood and paper, chemicals, non-metallic minerals, base metals, machinery and others.

2.2 Introducing implicit time trade costs into the GTAP model

Trade costs have an "iceberg effect" in Hertel's view, that is, large, hard-to-measure and non-disclosed costs. Hertel's GTAP model can reflect invisible trade costs and non-tariff barriers and other time costs that are difficult to measure directly. The trade costs caused by unstable factors are difficult to measure directly, but their impact on trade is far-reaching and

important. Considering that there are many unstable factors, in order to facilitate practical operation, the article converts these unstable factors into "time cost", which is specifically measured by "trade time equivalent tariff". In order to measure such hidden costs, the trade flow data of China's land neighbors in the V10 database of GTAP is used. The revised law is widely used in the study of trade issues, and the relationship is as follows:

$$PMS^*_{irs} = PMS_{irs} / AMS_{irs} \tag{1}$$

where is the effective price of commodity i imported from the target market s of country r at market price, and AMS is the unobserved technical coefficient, representing the unobserved trade cost of the importer. The exporter's effective quantity is related to price, and the relationship between the price and quantity of the observable commodity and the actual commodity price and quantity is as follows:

$$QXS^*_{irs} = QXS_{irs} / AMS_{irs} \tag{2}$$

where QXS is the effective quantity of item i. After combining the above two equations, the import demand equation and the import price equation are obtained.

$$qxs^*_{irs} = -ams_{irs} + qim_{is} - \sigma^i_m \times \left[pms_{irs} - ams_{irs} - pim_{is} \right] \tag{3}$$

$$pimis = \sum\nolimits_k \theta_{iks} \times \left[pms_{iks} - ams_{iks} \right] \tag{4}$$

In the above equation (3) is the import equation and (4) is the export equation. The meaning of each symbol is as follows:

qxs_{iks}: The proportion of bilateral imports changes, importing goods i from the market of country s.

qxs_{irs}: Changes in the proportion of goods i imported from the s market.

σ^i_m : The elasticity of substitution for imported goods i.

pms_{irs}: The value of the change in the price ratio of goods i imported from the market of country s.

ams_{irs}: is the change in the effective price ratio of goods i imported from the market of country s in the observed trade cost.

pim_{is}: The average price change of imported product i from market s.

θ_{iks}: Imports i from market k as a share of total imports from market s.

2.3 Model scenario setting

China's border areas are basically included in the country's construction pattern of "six corridors and six roads, multiple countries and multiple ports", and these economic networks closely connect China's "land borders" with more than 40 neighboring countries and regions.Professor Zhou Ping, "Yangtze River Scholar" of Yunnan University, in "The Land Frontier: The New Growth Pole of National Development", "Regional Differences and Differential Governance of China's Land Frontiers"and "China's Land Frontier Governance and Its Research", Based on the differences in the actual situation of China's frontiers, this paper sets the land frontier topic as three scenarios of the northeast line, the northwest line and the southwest line, and scores according to the radiation power of the geographical distance of the economic corridor.

Table 1. Proportion of rising trade costs caused by instability (%)

	Northeast line	Northwest line	Southwest line		Northeast line	Northwest line	Southwest line
Russia	50	30	0	Pakistan	0	65	0
North Korea	40	0	0	India	0	50	35
Mongolia	50	20	0	Nepal	0	0	20
Kazakhstan	0	60	0	Bhutan	0	0	35
Kyrgyzstan	0	55	0	Myanmar	0	0	55
Tajikistan	0	55	0	Laos	0	0	40
Afghanistan	0	30	0	Vietnam	0	0	65

Northeast Line: The reason for setting up is that the China-Mongolia-Russia Economic Corridor connects them in series. It involves Heilongjiang, Jilin, Liaoning and Inner Mongolia in my country. It borders North Korea, Russia and Mongolia. Due to historical reasons, the internal economies of these three countries are relatively stable and less disturbed, and the trade led by the government is relatively active, lasting and stable.

Northwest Line: The reason for the establishment is that major economic projects such as the New Eurasian Continental Bridge Economic Cooperation Corridor, China-Central Asia-West Asia Economic Cooperation Corridor, and China-Pakistan Economic Corridor have far-reaching influence and radiation on China's northwest frontier and northwest inland. Countries connected to the program include Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Austria, the Netherlands, Finland, Russia, etc. The overall economic strength of this plan connecting the inland regions is relatively insufficient, and there are many uncertain factors in the surrounding countries, so it is stronger than the northeast, but weaker than the southwest.

Southwest Line: The reason for setting up is that the "China-Indochina Peninsula Economic Cooperation Corridor" and the "Bangladesh-China-India-Myanmar International Economic Cooperation Corridor" run through the economy of the entire south and southwest of China, involving the entire Beibu Gulf, Hainan, the Pearl River-Xijiang Economic Belt, and the Central South. , the southwest region is connected,These regional economies at home and abroad are also relatively active and developed, which further enhances the economic vitality of Tibet, Yunnan, Guangxi, Guangdong and other places, and connects foreign countries such as Singapore, Vietnam, Laos, Cambodia, Thailand, and Malaysia. are active.

3. Simulation results and analysis

The overall economy of the northeast, northwest and southwest lines is significantly different, and the import and export trade also has a large performance difference under the influence of unstable factors. Table 3 evaluates the impact of unstable trade under time-equivalent tariffs on the import and export of these three schemes, and the conclusions are as follows. First, the non-stable trade import and export of the northwest line has the greatest impact, followed by the northeast line, and finally the southwest line. The northwest has weak economy, low level of trade development, low social consumption power, and obvious unstable factors in neighboring countries. The impact of unstable factors on exports (-11.4%) is greater than the impact on imports (-7.7%).

In the northeast line, North Korea has a significant impact on the form of Northeast Asia, and multilateral trade will undergo major changes (9.2% of imports). The impact of the southwest is relatively small (3.4% of imports, 2.9% of exports). Historical reasons and the need to develop the border economy have made the neighboring countries in the southwest have frequent trade with China for a long time, and there are fewer unstable factors in each country.Pakistan is the most prominent in the northwest line. Due to frequent internal unrest, economic siege and political differences between India, its trade has been affected the most (imports -8.6%). Compared with Afghanistan, Tajikistan and Kyrgyzstan, due to the The economic and trade ties between them are not deep enough, so the overall impact on trade is small.Mongolia's overall impact in the Northeast (-3.4% of imports) and Northwest lines (-3.2% of imports) is relatively stable. On the southwest line, the most significant is Vietnam’s exports (10.4%). Vietnam’s manufacturing industry has gradually developed, and its dependence on China’s exports has decreased. On the contrary, China’s dependence on Vietnam’s manufacturing has deepened. It is worth noting that India’s exports (-1.3%) and imports (-1.9%) in the northwest were less affected overall, but the impact was relatively significant in the southwest, with imports losing 3.8% and exports 9.3%. Both Southwest and China have economic and trade relations with China, but due to the unstable situation in the Northwest, the economic and trade impact on the Northwest Line has little impact, but the impact on the Southwest Line is significantly magnified.

Table 2. Time-equivalent tariff rate of change in trade (%)

	Whole		Northeast line		Northwest line		Southwest line	
	Export	Import	Export	Import	Export	Import	Export	Import
Russia	-10.07	-10.74	-5.96	-6.36	-9.21	-5.22	-10.07	-10.74
North Korea	-4.81	-1.07	0.12	0.03	0.12	0.03	-4.81	-1.07
Mongolia	-3.09	-6.44	-3.44	-1.50	-3.28	-0.08	-3.09	-6.44
Kazakhstan	0.12	0.12	-0.13	-7.27	0.12	0.12	0.12	0.12
Kyrgyzstan	0.07	0.08	-0.13	-2.29	0.07	0.08	0.07	0.08
Tajikistan	0.03	0.09	-0.15	-2.73	0.03	0.09	0.03	0.09
Afghanistan	0.03	0.16	-0.07	-1.61	0.03	0.16	0.03	0.16

Pakistan	0.10	0.15	-2.43	-9.64	-8.63	-2.32	0.10	0.15
India	0.23	0.24	0	0	-2.92	-3.29	-3.85	-9.33
Nepal	0.08	0.16	0	0	-1.56	-3.02	0.08	0.16
Bhutan	0.08	0.13	0	0	-2.79	-4.47	0.08	0.13
Myanmar	0.15	0.17	0	0	-8.14	-9.17	0.15	0.17
Laos	0.09	0.18	0	0	-3.63	-6.95	0.09	0.18
Vietnam	0.15	0.20	0.15	0.20	-9.64	-12.98	0.28	-10.44
Average	-1.20	-1.18	-2.68	-3.61	-2.35	-3.14	-1.20	-1.18

Note: The rate of change in trade of equivalent tariffs at non-stable time = annual trade time ratio (import or export) * annual equivalent tariff rate. It is difficult to directly measure stability. We use "frictional trade cost" (Werner and Marc, 2005) to express, and frictional trade cost refers to the cost consumed in addition to the normal expenditure cost due to incomplete information in the process of completing the expected goal.

We believe that the most significant problem caused by instability is the loss of communication mechanism, integrity mechanism and information transmission mechanism, which invisibly increases the cost outside normal trade, that is, the cost of frictional trade.Usually the overall magnitude of the change in frictional trade costs is one percent of the value of the goods being transported. Research shows that after 9/11 in the United States, frictional trade costs increased by 3% (Peter and Nora, 2006)。

Table 3. Time-equivalent tariff rate of change in trade by industry (%)

	Agriculture	Mine	Food	Spin and weave leather	Wood paper	Chemistry	Non-Metallic minerals	Basis metal	Machinery	Other	All product
Russia	-0.9	-0.6	-0.6	-0.1	-0.6	-0.4	-0.7	-0.8	-0.5	-0.5	-0.6
North Korea	-70	-10	-60	0	-5	-5	-5	-5	-5	0	-16.5
Mongolia	-0.7	-0.3	-0.2	-0.1	-0.3	-0.1	-0.4	-0.6	-0.2	-0.4	-0.3
Kazakhstan	-0.7	-0.5	-0.3	-0.1	-0.2	-0.2	-0.4	-0.6	-0.2	-0.2	-0.3
Kyrgyzstan	-0.6	-0.3	-0.2	-0.1	-0.2	-0.1	-0.3	-0.4	-0.2	-0.5	-0.3
Tajikistan	-0.6	-0.3	-0.1	-0.1	-0.2	-0.1	-0.4	-0.3	-0.3	-0.4	-0.3
Afghanistan	-0.4	-0.2	-0.1	-0.2	-0.1	-0.1	-0.3	-0.4	-0.2	-0.3	-0.2
Pakistan	-0.4	-0.3	-0.3	-0.3	-0.1	-0.1	-0.4	-0.4	-0.5	-0.5	-0.3
India	-0.8	-0.5	-0.4	-0.4	-0.2	-0.4	-0.6	-0.7	-0.6	-0.6	-0.5
Nepal	-0.4	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2
Bhutan	-0.3	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.2	-0.2
Myanmar	-0.5	-0.2	-0.3	-0.2	-0.2	-0.2	-0.4	-0.3	-0.2	-0.2	-0.3
Laos	-0.5	-0.2	-0.2	-0.1	-0.2	-0.2	-0.5	-0.1	-0.1	-0.2	-0.2
Vietnam	-0.9	-0.4	-0.5	-0.3	-0.4	-0.6	-0.6	-0.6	-0.5	-0.3	-0.6
Dongbei line	-23.87	-3.36	-2.27	-0.07	-1.97	-1.83	-2.1	-2.13	-1.9	-0.3	-5.8
Xibei line	0.06	0.83	0.18	0.13	0.18	0.13	0.35	0.43	0.23	0.35	0.28
Southwest line	-0.54	-0.26	-0.3	-0.21	-0.19	-0.24	-0.27	-0.13	-0.26	-0.31	-0.33
Amount to	-0.6	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.3

Note: The data source is the V10 database of Data Basecycle in GTAP. The rate of change in trade of each industry is based on the rate of change in trade of equivalent tariffs at import and export time. The Northeast Frontier is based on the average of the rate of change (%) of trade in the corresponding industries involving Russia, North Korea, and Mongolia. The Northwest Frontier is based on the average rate of trade change (%) in the corresponding industries involved in Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, and Pakistan. The Southwest Frontier is based on the average of the trade change rate (%) in the corresponding industries involved in India, Nepal, Bhutan, Myanmar, Laos, and Vietnam.

Countries with higher stability tend to create lower transportation costs. This is because stability represents the mutual adaptation of social structures and effective social governance by the government. At this level, the government will increase investment in infrastructure and reduce the cost of factor circulation. Improve the efficiency of resource flow, further optimize social governance, and create conditions for meeting people's further needs. The second is the dependence of internal changes on the internal forces of society. Stable countries tend to expand trade. Security is the basic need of the public, and stability provides conditions for security. On the basis of social security, the country will promote market prosperity through trade, improve people's lives, and achieve the goal of further optimizing social security. The third is the

pursuit of high marginal benefits from technical capabilities. Countries with low transportation costs tend to expand trade. Transportation costs consist of infrastructure, transportation tools and their software supporting costs. Low transportation costs represent a country's strong cost management and operation capabilities, and also reflect its level of efficiency. China has high economic efficiency and cost management capabilities, naturally has strong competitiveness in international trade, and tends to obtain more benefits in international trade.

4. Conclusions and policy implications

4.1 Main conclusions

Infrastructure has strong adhesion to the connection between the frontier area and the central area. The increase in the scale and density of border infrastructure has multiple meanings. First, it will enhance the state's control over the border areas. Second, it will increase the rate and total amount of resource elements flowing to the border areas. Third, it will enhance the mutual understanding between the border areas and the central area. Infrastructure plays a role as a bridge in achieving stability and at the same time has a benign effect, which is another key factor in regional development. At the same time, the quality of infrastructure, including management and services, as well as public favorability, also determines whether it is conducive to the consolidation of stability or the growth of trade. The stabilization effect plays a significant role in promoting trade growth, because investors tend to pay attention to the inherent attractiveness and investment value of a stable system, which is of great help to investment behavior and factor agglomeration.The enhancement of infrastructure scale, density, service capability, transparency and openness will help reduce transportation costs and generate investor enthusiasm for investment, thus forming the positive effect of what is commonly referred to as "building roads before getting rich". For the frontier, this effect may be further strengthened through domestic and foreign trade, and the growth of trade may be the most obvious.

4.2 Policy suggestions

4.2.1 Create a reasonable development model

Yahia Zoubir, director of the Geopolitical Research Center at KEDGE Business School in France, believes that the Middle East is not only facing traditional security threats, but also many other types of security problems.The long-standing security problems in the Middle East are partly due to the lack of a sound development model in the region.The current security situation in the Middle East is grim, largely due to insufficient, unbalanced and even distorted development, which has exacerbated the insecurity of the people in the Middle East.This irrational development model has resulted in a small number of people in the Middle East getting richer than before, but most people have become poorer.In fact, the Middle East issue is only a microcosm of the international security issue. The region where the security situation is not good is fundamentally caused by the distortion of its own development. Internal conflicts are the main cause of anxiety. Therefore, unstable regions should pay attention to their own social structure and poverty, commit themselves to social improvement, and find a development model that suits them.

4.2.2 Play a role in the security affairs of neighboring countries

China has 14 land neighbors and 7 maritime neighbors, which means that it is impossible for China not to care about its own security and that of its neighbors. In the extremely self-interested national security order established by European and American countries, China has a long-standing and sound cooperation model for dealing with security issues with neighboring countries.In the process of China's restoration of its legitimate seat in the United Nations, Middle Eastern countries, especially Arab countries, have also given China strong support. China's Middle East policy has the following characteristics: insisting on non-interference in internal affairs and respect for national sovereignty, not seeking to dominate and control the regional situation, insisting on multilateralism and giving play to the role of the United Nations, insisting on dialogue and consultation, advocating to solve the Middle East dilemma from the perspective of development, and focusing on comprehensive governance And treat both symptoms and symptoms. China's Middle East policy is in line with the objective development situation of the Middle East, which is conducive to further deepening the cooperative relationship between China and the Middle East countries in the future.

4.2.3 Appropriate technology export and economic cooperation

China has a long, profound and even complicated historical tradition with its neighbors. It is decided that China must use its own advantages to deepen mutual trust and cooperation with its neighbors.On the one hand, China must take the initiative to achieve political mutual trust with its neighbors, which means that it must make good use of diplomatic means to interact with its neighbors in a more friendly and equal manner; on the other hand, it must actively enhance its economic influence and absorption capacity.This means that under the premise of the current economic advantages, China can deepen economic

cooperation with neighboring countries, drive trade with neighboring countries, and help weak countries build infrastructure by exporting engineering and manufacturing technologies with comparative advantages to neighboring countries.Taking border economic corridor projects (such as the China-Singapore Economic Corridor, the Bangladesh-China-India-Myanmar Economic Corridor, the China-Pakistan Economic Corridor, the China-Iran-Turkey Economic Corridor, the New Road and Bridge Economic Corridor, and the China-Mongolia-Russia Economic Corridor) as the starting point to create a more open economy and strengthen Regional economic integration.

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