

Research on Trade Characteristics between China and Belt and Road Initiative Countries (Postprint)

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Abstract

Unimpeded trade constitutes a key component and core element of the Belt and Road Initiative construction. Based on an analysis of the macroeconomic situation of trade cooperation between China and countries along the route, this paper comprehensively examines the trade characteristics between China and these countries from the perspectives of trade scale, trade connectivity, trade balance, and trade networks, and employs models to project the future trade growth potential between China and various countries along the route. The research findings indicate: (1) Trade between China and countries along the route has grown rapidly, with trade connectivity becoming increasingly close; since 2014, the trade balance has shifted from deficit to surplus. (2) The trade network of Belt and Road countries can be identified as comprising three primary clusters and two secondary clusters; from the perspective of China's trade pattern, Southeast Asia has the closest trade connectivity with China, followed by West Asia. (3) The countries with the greatest trade development potential with China along the route are primarily Southeast Asian countries, Russia, India, Saudi Arabia, the United Arab Emirates, etc.

Full Text

Studies for Building the Belt and Road: Research on Trade Characteristics between China and Countries along the Belt and Road

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Abstract

Unimpeded trade is a key component and core element of the Belt and Road Initiative, serving as an important means to promote economic prosperity and regional cooperation among participating countries. Based on analysis of the macro-level trade cooperation situation between China and Belt and Road countries, this paper comprehensively examines trade characteristics from perspectives of trade scale, trade connectivity, trade balance, and trade network structure. Building upon this analysis, the study employs modeling to calculate future trade growth potential between China and individual countries along the Belt and Road. The findings indicate: (1) Trade between China and Belt and Road countries has grown rapidly with increasingly close connections, and the trade balance shifted from deficit to surplus beginning in 2014. (2) The trade network among Belt and Road countries reveals three major communities and two sub-communities; from China's perspective, Southeast Asia maintains the closest trade ties, followed by West Asia. (3) Countries with the greatest trade development potential for China are primarily located in Southeast Asia, along with Russia, India, Saudi Arabia, and the United Arab Emirates.

Keywords: China, Belt and Road countries, trade cooperation, spatial-temporal characteristics, trade potential

1 Research Methods and Data Sources

The Belt and Road Initiative represents an inclusive globalization proposal aimed at maintaining the global free trade system and an open world economy. As an open framework without precise spatial boundaries, this study defines its scope to include 65 countries along the Belt and Road for analytical purposes.

The primary analytical method employed is community detection, which identifies community structures within networks based on topological relationships and nodal attributes. The fundamental characteristic of this approach is that connections within communities are dense while connections between communities are relatively sparse. Specifically, this study utilizes the modularity optimization algorithm, treating countries as nodes in the trade network, bilateral trade relationships as edges, and trade flows (using total import-export volumes) as edge weights. The modularity formula is:

$$Q = \frac{1}{2m} \sum_{ij} \left[A_{ij} - \frac{k_i k_j}{2m} \right] \delta(c_i, c_j)$$

where A_{ij} represents the trade flow between country i and country j , k_i (or k_j) denotes the sum of all trade flows connected to country i (or j), c_i (or c_j)

indicates the community index of country i (or j), $\delta(c_i, c_j)$ is a function that equals 1 when countries i and j belong to the same community and 0 otherwise, and m represents the total trade flow of the entire network. Higher Q values indicate greater modularity.

Trade data used in this study are obtained from the International Trade Centre database and cross-verified with trade data from China Customs Information Network. GDP, population, per capita GDP, and industrial structure data are sourced from the World Bank database.

2 Trade Characteristics

2.1 Trade Scale

2.1.1 Rapid Expansion of Trade Volume Since 2000, trade between China and Belt and Road countries has experienced rapid growth despite fluctuations [Figure 1: see original paper]. Particularly before the 2008 global financial crisis, trade exhibited high-speed development, with total trade volume increasing from \$92.799 billion in 2001 to \$686.735 billion in 2008, representing an average annual growth rate of 33.10%. Although trade volume declined sharply in 2009 due to the financial crisis, it recovered quickly afterward, maintaining a relatively fast development trajectory with an annual growth rate of 12.29% during 2010–2014. In 2015, trade volume experienced a slight decline due to deteriorating global trade conditions and sharp drops in commodity prices.

2.1.2 Increasingly Close Trade Connections Since the 21st century, trade connections between China and Belt and Road countries have become increasingly close, with both parties gaining prominence in each other's foreign trade. On one hand, the share of Belt and Road countries in China's total foreign trade has continuously risen, increasing from 18.21% in 2001 to 28.86% in 2015. Specifically, export share grew from 14.47% to 27.00%, while import share increased from 22.29% to 31.37%. On the other hand, China has become an increasingly important trading partner for Belt and Road countries, with China's share in their total foreign trade rising from 4.67% in 2001 to 13.79% in 2015. Notably, China's position in the foreign trade of Kyrgyzstan, Turkmenistan, Myanmar, Tajikistan, Yemen, Iran, and the Philippines has improved rapidly, with share increases exceeding 30 percentage points.

2.1.3 Shift from Trade Deficit to Surplus In terms of trade balance, China experienced consecutive trade deficits with Belt and Road countries from 2001 to 2013, peaking at \$108.347 billion in 2011. A small trade surplus emerged in 2014 (\$8.912 billion), which expanded to \$88.716 billion in 2015. Overall, China's export growth rate to Belt and Road countries has outpaced its import growth rate, with average annual export growth of 21.90% versus import growth of 17.63% during 2001–2015. At the country level in 2015, China's largest trade surpluses were with India, Vietnam, Singapore, the United Arab Emirates, Turkey, and

Indonesia, while the largest deficits were with resource-rich countries including Nepal, Malaysia, Russia, Turkmenistan, Iraq, and Kuwait.

2.2 Trade Spatial Pattern

2.2.1 Overall Trade Network of the Belt and Road As shown in [Figure 2: see original paper], Belt and Road countries and China have formed a closely integrated trade network. Regarding specific trading partners within the Belt and Road framework, China ranks as the largest trading partner for 30 countries including Russia, India, Malaysia, Singapore, Indonesia, and Turkey; the second-largest trading partner for 11 countries including Kazakhstan, Qatar, Ukraine, and the United Arab Emirates; and the third-largest trading partner for 7 countries including Belarus and the Czech Republic. This demonstrates that China has established itself as a core node in the Belt and Road trade network.

Community detection results identify three major communities and two sub-communities within the Belt and Road trade network [Figure 3: see original paper]. The largest is the Eurasian community centered on China, comprising 24 countries where China serves as the core node in both trade scale and connectivity, followed by Russia as a secondary node, and then Belarus, Turkey, Kazakhstan, and Ukraine. The second major community is the South Asia-West Asia community, including 16 countries. Key nodes by trade volume are India, the United Arab Emirates, and Saudi Arabia, followed by Qatar, Oman, and Egypt. This community consists primarily of resource-exporting countries, particularly Middle Eastern nations whose economic development heavily depends on oil resources, resulting in relatively poor trade structure diversity. The third major community is the Central and Eastern Europe community, including 17 countries with no obvious trade center, where the Czech Republic, Poland, Slovakia, Hungary, and Romania are relatively large nodes. The two sub-communities are: (1) the Southeast Asia sub-community comprising 5 countries with close internal trade ties, where Singapore, Malaysia, and Indonesia have high trade volumes; and (2) the South Asia sub-community comprising 3 countries, where Pakistan's largest trading partner is China and Afghanistan's largest trading partner is Pakistan.

Notably, the core nodes of the Eurasian community, South Asia-West Asia community, and Southeast Asia sub-community are all countries with close trade ties to China. However, in the Central and Eastern Europe community, only Poland maintains relatively close trade relations with China, indicating that China's trade competitiveness in Central and Eastern Europe requires further enhancement.

2.2.2 Regional Trade Networks From the perspective of China's trade spatial pattern with Belt and Road countries, Southeast Asia maintains the closest trade ties [Figure 4: see original paper]. In 2015, total trade volume between China and the 11 Southeast Asian countries reached \$423.692 billion,

accounting for 42.37% of China's total trade with Belt and Road countries. West Asia ranks second, with trade volume of \$240.55 billion (24.13% of the total). South Asia, Mongolia-Russia, and Central and Eastern Europe each account for approximately 9%, while Central Asia's trade scale with China is relatively small at 4.96%. At the country level, China's major trading partners are Malaysia, Vietnam, Singapore, Thailand, India, Russia, and Indonesia, each representing over 5% of total trade with Belt and Road countries. China's primary export destinations are Vietnam, India, Singapore, Malaysia, Thailand, the United Arab Emirates, Russia, and Indonesia, each accounting for over 5% of exports to Belt and Road countries. Major import sources are Malaysia, Thailand, Russia, Saudi Arabia, and Singapore, each representing over 5% of imports from Belt and Road countries.

3 Trade Potential Analysis

3.1 Reference Indicators for Trade Potential

(1) Trade Growth Rate. The growth rate of trade between China and Belt and Road countries reflects evolving trade connections. Analysis shows that trade with Central Asia is becoming increasingly close, while growth with Russia-Mongolia is relatively slow [Figure 5a: see original paper]. During 2001-2015, 12 countries including Turkmenistan, Tajikistan, Georgia, Armenia, Maldives, Slovakia, Uzbekistan, Bosnia and Herzegovina, Azerbaijan, Iraq, Laos, and Belarus achieved average annual growth rates exceeding 30%, demonstrating strong trade growth momentum and increasingly close ties. The fastest export growth occurred with Tajikistan, Georgia, and Belarus, while the fastest import growth was with Albania, Turkmenistan, and Macedonia.

(2) Market Size of Belt and Road Countries. In terms of economic scale (GDP), the largest markets are India and Russia, each with GDP exceeding \$1.3 trillion, followed by Indonesia, Turkey, Saudi Arabia, Poland, Thailand, the United Arab Emirates, and Egypt, all with GDP surpassing \$300 billion [Figure 5b: see original paper]. Regarding population size, the distribution remains relatively stable, with India having the largest population at 1.311 billion, while Indonesia, Pakistan, Bangladesh, Russia, and the Philippines each have populations exceeding 100 million. Maldives, Brunei, Montenegro, Bhutan, Timor-Leste, and Estonia have relatively small populations [Figure 5c: see original paper].

(3) Economic Development Level. According to World Bank standards, Qatar and Singapore consistently rank highest in per capita GDP. The United Arab Emirates, Israel, Kuwait, Bahrain, Saudi Arabia, and Oman in West Asia; Slovenia, Estonia, the Czech Republic, Slovakia, Lithuania, and Latvia in Central and Eastern Europe; and Brunei constitute 13 high-income countries. Twenty-one countries including Poland, Hungary, and Croatia are classified as upper-middle-income countries, while Tajikistan, Nepal, and Afghanistan are low-income countries [Figure 5d: see original paper].

Based on comprehensive analysis, Singapore, Malaysia, the United Arab Emirates, Thailand, Vietnam, and Slovakia exhibit rapid trade growth with China, possess sufficient market size, and maintain high economic development levels, indicating substantial trade potential. India, Russia, Turkey, Saudi Arabia, Poland, Egypt, and Pakistan also demonstrate considerable trade potential due to their large trade volumes and market sizes.

3.2 Trade Potential Forecast

Based on trade data from 2001–2015 and considering trade growth rates, market size, and economic development levels of Belt and Road countries, this study employs regression analysis to model trade growth. Through comparison of several common fitting functions, the model with the best fit (maximum R^2) was selected to forecast trade development in 2020, with results shown in [Figure 6: see original paper].

Forecasts indicate that countries with the greatest trade development potential for China are Malaysia, Russia, Singapore, India, Thailand, and Vietnam, with bilateral trade volumes expected to exceed \$100 billion by 2020. Secondary potential partners include Saudi Arabia, Indonesia, the United Arab Emirates, Iran, and the Philippines, with bilateral trade volumes projected to surpass \$50 billion by 2020.

4 Conclusions and Discussion

Analysis of trade characteristics and spatial patterns between China and Belt and Road countries, combined with consideration of historical and cultural connections alongside resource endowments, economic conditions, and demographic factors, enables identification of trade growth potential and regional division of labor. This approach helps build an “open, inclusive, balanced, and beneficial regional economic cooperation framework.”

Research findings suggest that in the near term, priority countries for trade cooperation under the Belt and Road Initiative include Singapore, Malaysia, Thailand, Vietnam, the United Arab Emirates, Russia, India, Indonesia, and Saudi Arabia. For Singapore, Malaysia, Thailand, Vietnam, and the United Arab Emirates, cooperation should focus on identifying new trade growth points and accelerating trade expansion. For Russia, India, Indonesia, and Saudi Arabia, efforts should emphasize broadening cooperation fields and promoting market opening. Countries of secondary importance include Iran, the Philippines, Turkey, Iraq, Kazakhstan, and Pakistan, where attention should be paid to relatively low market openness, necessitating enhanced high-level communication to unlock trade potential and expand cooperation areas. Countries with substantial future trade potential include Oman, Hungary, the Czech Republic, Myanmar, and Kyrgyzstan.

Note: Figure translations are in progress. See original paper for figures.

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