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Assessing the welfare effects of Iran's accession in BRICS: A global simulation approach (GSIM)

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Abstract

In recent decades, the global economic and geopolitical landscape has undergone profound transformations, marked by the rise of emerging powers and a shift toward a multipolar world order. Within this context, the accession of the Islamic Republic of Iran to the BRICS group in January 2024 signifies a deepening of cooperation among emerging economies and presents a strategic opportunity to enhance economic collaboration, gain access to larger markets, facilitate trade in national currencies, and mitigate the impact of sanctions. While most previous studies have been limited to broad analyses, this research aims to fill a critical gap by examining the welfare and trade effects of Iran's membership at the commodity level. Addressing the lack of detailed studies on the trade implications of Iran's accession to BRICS, this research employs the Global Simulation Model (GSIM), a partial equilibrium framework, to evaluate the impacts of four tariff reduction scenarios. The analysis is based on 860 HS4-level product codes with revealed comparative advantage, using data extracted from UN Comtrade and MacMap and processed through Python. The results indicate that full trade liberalization could generate $13.1 billion in net welfare gains for Iran. A trade creation to trade diversion ratio of 2.71 highlights substantial benefits. Sectors such as mining, plastics, and machinery experience the highest gains, whereas plant-based products (e.g., corn) suffer losses. Formulating a targeted trade strategy—by excluding loss-making products and optimizing tariff reduction levels—can increase Iran's net welfare by up to 27.2%. Active participation in BRICS, through reorienting trade flows from limited traditional partners to more diverse intra-group markets, can significantly enhance the country's economic resilience.

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Extended Abstract

Introduction

In recent years, the global economic and geopolitical order has gradually shifted toward a multipolar structure centered on emerging powers such as China, India, and Brazil. Within this context, the expansion of the BRICS group—especially the admission of new members including the Islamic Republic of Iran in January 2024—has attracted growing academic and policy attention. BRICS, originally formed by Brazil, Russia, India, and China and later joined by South Africa in 2011, has come to symbolize the rise of emerging economies seeking to reform global governance and enhance multilateral cooperation.

With the inclusion of Iran, Egypt, Ethiopia, Saudi Arabia, and the UAE, BRICS now represents a greater share of the world's population, resources, and GDP—accounting for over 31% of global output according to the World Bank (2023). This expansion reflects a strategic shift toward a more inclusive and multipolar world order. For Iran, BRICS membership may offer access to new markets, trade in local currencies, reduced dependence on the U.S. dollar, greater investment flows, and enhanced cooperation in areas like energy and transport.

From a political economy perspective, Iran's accession may also contribute to mitigating the effects of sanctions and improving its position in global negotiations. This research aims to analyze the potential welfare impacts of Iran's BRICS accession, focusing on trade creation and diversion effects using the Global Simulation Model (GSIM) developed by Francois and Hall (2002), implemented via the WITS platform. The simulation covers over 860 four-digit HS product codes, allowing for sector-specific analysis.

Aim

Ultimately, the findings aim to support evidence-based policymaking by identifying products with comparative advantage and estimating how targeted trade agreements within BRICS could improve national welfare. The study includes a literature review, methodology, simulation results, and concluding discussion.

Methodology

To that end, this research employs the Global Simulation Model (GSIM) developed by François and Hall (2003), also used in the World Integrated Trade Solution (WITS). As a partial equilibrium model, GSIM enables precise assessment of welfare impacts and quantification of trade creation and diversion across member and non-member countries. The analysis incorporates bilateral trade interactions across sectors and assumes global market clearing and substitutability among trade sources. Over 860 HS4 product codes were analyzed, selected based on trade values exceeding $1 million over a decade and a revealed comparative advantage (RCA) in at least two countries. Data were

drawn from the UN Comtrade and ITC MacMap databases and processed via Python. Analysis of tariff distributions revealed that the largest number of products (390) had tariff rates between 5–10%. Agriculture and animal products (26%) and metals, machinery, and equipment (24%) had the highest average tariffs. At the HS section level, Section XII (metals and machinery) had an average tariff of 48%, followed by Section II (agriculture) with 32%.

Findings

To evaluate the economic impacts of Iran's BRICS membership, the model was run under four tariff reduction scenarios: 25%, 50%, 75%, and 100% liberalization. Welfare gains were observed for all BRICS members across all scenarios (Table 1), with net positive effects even under full liberalization, despite decreasing tariff revenues. These gains reflect the advantages of increased competitiveness and access to cheaper imports. In contrast, non-member countries consistently experienced net welfare losses due to trade diversion, where imports shift away from them in favor of BRICS members.

Table 1. Overall results under four scenarios (Million USD)

Tariff reduction scenario		25%	50%	75%	100%
Total welfare surplus	Member countries	13713.09	28259.972	43659.9	59932.59
	Rest of the world	-3881.96	-9115.885	-13733.5	-18391
Tariff revenue changes	Member countries	-4016.55	-10675.45	-20003.3	-32026.7
	Rest of the world	-2583.3	-5181.127	-7793.52	-10420.5
Net welfare	Member countries	9696.543	17584.52	23656.59	27905.9
	Rest of the world	-7121.37	-14297.01	-21527	-28811.5

Source: Research findings

In the full liberalization scenario, Iran accounted for 42.1% of total tariff revenue reduction among members, highlighting its strong reliance on tariff revenues and the need for compensatory policy mechanisms. Nonetheless, Iran's net welfare was still positive at $1,134.88 million (Table 2), driven by gains in consumer and producer surplus.

Analysis of trade creation and diversion under full liberalization showed that China and India achieved the highest trade creation—$45.24 billion and $43.97 billion respectively. Iran ranked next, with $14.43 billion, followed by Russia with $12.25 billion, indicating Iran's strong potential for intra-BRICS trade expansion. Trade diversion was also significant: China experienced $27.65 billion and India $23.72 billion. For Iran, the figure was $5.32 billion. However, all countries exhibited a trade creation-to-diversion ratio above one, confirming that

welfare gains from trade creation outweighed losses from diversion. For Iran, this ratio was 2.71, even higher than for larger economies, highlighting the efficiency of BRICS membership for the country.

Table 2. Summary of welfare effects for member and other countries (Million USD)

Countries	Total welfare	Tariff revenue changes	Net welfare
United Arab Emirates	4357.13	-1516.2	2840.95
Brazil	8097.19	-3937.0	4160.17
China	18103.22	-7598.6	10504.67
Egypt	1516.21	-906.5	609.74
Ethiopia	1153.42	-770.6	382.83
India	11548.93	-8137.8	3411.14
Iran	4317.82	-3182.9	1134.88
Russia	5034.85	-2579.3	2455.55
Saudi Arabia	2641.61	-1701.1	940.46
South Africa	3162.19	-1696.7	1465.51
Rest of the world	-18390.96	-10420.5	-28811.47

Source: Research findings

At the HS2 level, Iran's greatest welfare gain under full liberalization occurred in Section V (mineral products), totaling $257.08 million. This gain was primarily driven by Chapter 27 (mineral fuels), which contributed 97.63% to this section's welfare increase, indicating a strong positive impact despite associated revenue losses due to increased competitiveness and exports. Other key sectors that experienced significant net welfare gains, each exceeding $100 million, included plastics and rubber (Section VII), machinery and electrical equipment (Section XVI), chemicals (Section VI), and textiles and textile articles (Section XI). Conversely, vegetable products (Section II) and live animals and animal products (Section I) showed minimal or even negative effects on net welfare under full liberalization. Specifically, certain commodity chapters within these sectors, such as oil seeds and oleaginous fruits (Chapter 12) in Section II, exhibited adverse impacts on welfare, mainly due to the significant decline in tariff revenues that outweighed any gains in consumer or producer surplus. Similarly, within Section VII (plastics and rubber), specific HS4 codes like 3901 (polymers of ethylene) were highly impactful, and 4011 (rubber tires) also contributed significantly to net welfare. On the other hand, codes like 1201 (soybeans) and 1005 (maize) in Section II recorded substantial net welfare losses, primarily due to sharp revenue losses that consumer surplus gains could not offset.

The progression of net welfare across gradual tariff reductions

revealed diverse patterns, including continuous declines for some products and inverted-U shapes for others—where initial gains were followed by losses at full liberalization. This highlights the critical need for commodity-specific tariff strategies rather than uniform liberalization approaches.

Conclusion

1. Based on these patterns, the study proposes an optimized agreement design.
2. Exclude products with a continuous decline in net welfare from the agreement.

For products exhibiting inverted U-shaped responses (identified in 216 codes), apply partial tariff cuts (50% or 75%)– 153 codes optimized at 75% reduction, and 63 at 50%.

Implementing this tailored approach significantly increases Iran's net welfare to $1,443.91 million—a 27.2% increase over the outcome of blanket full liberalization. This confirms that a micro-level analysis can effectively preserve tariff revenues while enhancing welfare gains. This methodology can serve as a robust guide for future trade agreement design. In conclusion, Iran's BRICS membership offers strong potential to boost economic welfare and trade integration. However, to fully realize these gains, a differentiated, data-driven tariff strategy is necessary—one that accounts for commodity-specific welfare effects and balances trade creation with revenue retention. Such a tailored approach enables Iran to maximize benefits while mitigating the risks associated with trade diversion and liberalization, contributing to sustainable overall public welfare.

Conflict of interest

The authors declared no conflicts of interest.

Authors' contributions

All authors contributed to the original idea, study design.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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