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Modern High -Tech Trade Networks

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Abstract:

In 2024, five countries (Egypt, Ethiopia, Iran, Saudi Arabia and the United Arab Emirates) joined the original BRICS countries (Brazil, Russia, India, China, South Africa), reflecting a clear commitment of the group to become a relevant global actor. This study explores the reshaping of global trade patterns by estimating the determinants of exports with a focus on the technological content of traded goods between the BRICS extended network with China. By estimating the determinants of exports with a focus on the technological content of traded goods, we explore the importance of China within the BRICS network and examine how BRICS modifies the trade pattern in mid- and high-technology products. Using a unique dataset, further augmented to include trade in technologically innovative products, this paper seeks to understand how technological capacity has a key role in the determination of China-BRICS technological trade. This paper uses modified gravity estimation methods to empirically examine how China, in the context of the BRICS countries, has been able to influence or alter trade patterns in BRICS countries, historically shaped by Global North countries. Results indicate export patterns are driven by Chinese trade patterns within an increasing network of the BRICS. Our findings suggest that greater R&D activities do not have a significant effect on high tech exports, while some positive results are found for mid-tech exports. Furthermore, the trade patterns in the expanded BRICS network are potentially also determined by Chinese high-tech exports as the drivers of more technologically advanced integration are based on the specific conditions of the participants. Thus, moving up the value chain is not necessarily made possible via technology imports, although China has been able to take advantage of greater exports in high-technology products.

Keywords: China, BRICS; trade; technical goods; innovation
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1. INTRODUCTION

While initially popular only within the finance industry due to the BRIC nomination by Goldman Sachs as an investment category of countries in 2006, when the heads of state of Brazil, Russia, India, China, and South Africa (BRICS) held their first summit in 2009, they transformed themselves into a political club. Many economic and political analysts expected only a limited impact yet, the BRICS has defied expectations, and even the relatively significant ideological swings in member countries have not altered the members' commitment to the club. BRICS summits have become more than a yearly photo-op as Egypt, Ethiopia, Indonesia, Iran, and the United Arab Emirates joined in 2024, although it is not a given that countries accept membership since Algeria and Argentina declined the invitation to join. The partner, or candidate, countries of Belarus, Bolivia, Cuba, Kazakhstan, Malaysia, Nigeria, Thailand, Uganda, and Uzbekistan were invited in 2024 and Turkey and Vietnam have submitted formal membership applications. Now ***BRICS***[2] remains a globally recognised brand, according to the Economist magazine. It is fully expected that more countries may potentially join as the political and economic interests of existing and new members fuse an alliance of states.

The enlargement of the BRICS group means that there is a more significant demographic and economic weight, accounting for nearly half the world's population (compared with just under 10% for the Group of Seven (G7))[3]. Although the expanded BRICS constitutes a significant economic group, the G7 countries continue to dominate global output, accounting for 43.2% of global GDP (Ross, 2024). The gap between the BRICS and the G7 is closing thanks to robust economic growth in emerging countries: according to forecasts by the International Monetary Fund (IMF), an expanded BRICS will account for 37.6% of world GDP at PPP in 2027, compared with 28.2% for the G7 (Afota et al, 2024). The BRICS, however, account for more than 43% of global oil production and control nearly 75% of rare earth minerals.

The limited trade integration amongst the BRICS countries and they are quite aware of the importance of innovation in this context such that in 2011, an attempt to reach agreements regarding science, technology, and innovation was part of the annual summit. Investments in innovations are important for firms and nations to compete and secure future competitive advantages in an increasingly globalized and uncertain economic environment (Vila, Pérez, & Coll-Serrano, 2014). According to UNCTAD (2013), "Over the past decade, FDI inflows to BRICS more than tripled to an estimated US$ 263 billion in 2012. As a result, their share in world FDI flows kept rising even during the crisis, reaching 20% in 2012, up from 6% in 2000".

However, a "China shock" of low-cost exports of everything from steel and chemicals to machinery has the potential for exasperating trade tensions within the network; a stronger BRICS could have a significant global impact in energy, trade networks, infrastructure, monetary policy, and technology (Azevedo et al., 2025). Zhao at the Carnegie Institute argues that, for China, BRICS engagement, supplements the Belt and Road Initiative' (BRI), geoeconomic focus as well as the Shanghai Cooperation Organization's geopolitical-security role leading to an expansion of China's global influence (Patrick et al., 2025). The BRICS group also expands Beijing's economic influence and shapes rules and standards in emerging technologies such as artificial intelligence. Thus, the effects of innovation on export production of high-technology goods is non-negligible. Given the increased tensions between the US and China, Beijing will likely further prioritize Global South countries through the BRICS network.

This paper contributes to the literature in three ways. First, we present a China-specific gravity model. There are few papers focusing on the specific trade patterns of China vis-a-vis their created trade networks, in this case, the BRICS countries. To do so, we use a unique data

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[2] We refer to the **BRICS**, meaning all current members, the partners, and the application countries included in this study.

[3] The USA, Canada, Japan, United Kingdom, Germany, France, and Italy are the G7.

set (BLOCS) as explained below. Second, we consider a trade relationship outside of the traditional mechanisms. The BRICS relationships, including those of their new partner countries, are potential drivers of world trade patterns. We first investigate whether there is an increase of mid- and high-tech exports from or toward China due to participation in this trade group. Furthermore, we investigate the relationship between FDI into and from BRICS, the resulting innovation, and the subsequent increase in trade with China in high-tech and medium-tech goods.

Third, very little comprehensive work exists concerning the expanding BRICS club, nor has the investment-innovation link been explored in its context. This paper attempts to fill this gap by examining the effect of investment into the BRICS countries, concentrating on the effects of innovation on the export and import production of high and medium tech export goods, in the context of their trade with China. Section 2 examines the relevant literature on BRICS and its expansion while Section 3 elucidates the proposed methodology. Section 4 provides some results of the empirical investigation and Section 5 discusses these results before we conclude in Section 6.

2. LITERATURE

The majority of the literature concerning the BRICS countries revolves around questions of regional politics and evaluations of the geopolitical role of the group. It is therefore interesting to postulate as to the exact nature of the BRICS agreement. Khathoun and Trivedy (2023) revisited the debate on political and economic power among the BRICS countries as regional politics and policies and concluded that BRICS is an important alliance opposing the USA and Europe. They further argued that to reach the level of the developed countries, BRICS countries must evaluate and contend with the gaps in economic development strategies that further help South-South development in general.

BRICS has already reached an important level of relevance in their political power and economic regional status. Nach and Ncwadi (2024) provide a complete examination of the literature concerning BRICS cooperation. They conclude that although there is significant economic and policy diversity within the BRICS, there exists a noticeable trend toward convergence driven by increasing trade linkages. The constitution of a cooperative political organization is a clear trend for the BRICS, however, it is debatable whether it acts as a regional trade agreement (in the sense of a trade institution) or a somewhat looser trade network. In this context, the literature has very little to say about how trade agreements affect the composition of products traded.

Since 2009, BRICS has amplified the voices of its members to collectively address global issues such as investment facilitation, climate change, poverty and reforms in international organisations. The economic benefits of the bloc include the intensification of trade amongst the members, reduction of barriers toward investment from the outside world and the establishment of related agreements. Economic cooperation is also aided by the structure of the economies of the first five BRICS members with their complementary endowments, especially China's manufacturing expertise (Tse and Hartwich, 2025).

Since investments are an important component of trade creation, there is general agreement in the literature as to the importance of FDI in economic growth and about its relevance in the international fragmentation of the production organized in the Global Value Chains (GVC). The question of the quality of FDI being responsible for growth disparities is still open. Khan et al. (2023) attempt to explain the growth disparity between the four major emerging countries (Brazil, Russia, India and China) and the non-BRIC countries. They find that FDI, gross capital formation, human capital, and infrastructure are important for economic growth. However, FDI, gross capital formation and human capital are more efficacious in BRICs. Moreover, the FDI seems to be more relevant in the presence of better-quality human capital and higher level of domestic investments in BRICs, potentially leading to higher technology product exports.

The absence of BRICS-wide free trade agreements, or agreements on the harmonization of product standards, lends toward a focus on the growing economic weight and partial political alignment among the members. The countries focus on enhancing trade relations, industrial development, and foster commiserate economic growth across the members. Cheong (2023) finds there is a positive role of PTAs in developing higher-technology export products. PTAs are shown to increase medium- and high technology product trade volumes between member countries, although he finds little impact for low-technology products. In further recent work, Khachoo and Ah Sheikh (2023) analyzed non-resident patenting and PTAs using a cross-country dataset on patent filings. Focusing on the BRICS, they examine the differentiation of shallow or deep trade agreements. They found that BRICS countries are increasing patent applications, especially by non-resident patent filings in comparison to developed countries suggesting a significant link between acceleration of trade flows and an increase in cross-country patent applications.

The effect of FDIs on innovation is positive in some studies and negative in other studies. Gür (2020), in an empirical study from 2007-2019, augmented with Turkish data, argued that what makes countries have higher globally competitiveness is their ability to be innovative. This ability, when combined with trade openness, is important in terms of learning and developing technology, thus contributing to an improvement in a country's innovation capability. They examined the importance of FDI on innovation, finding that exports have a positive effect on innovation, whereas imports and foreign direct investments adversely affect innovation. They further argued that FDI contribution to technological development and R&D activities and its subsequent ability to create an innovative export effect, depends on whether the host country has reached a certain level of technological industry capacity. We find similar results in our examination below.

Furthermore, Antonietti et al. (2025) show that regions with greater access to digital technology are prone to higher levels of income inequality although this negative link is mitigated by strong formal and *informal* institutions. BRICS' extended network of trade partners constitutes an informal cooperative institution. According to the IEA (2025), increased investment has resulted in and increased production of electric vehicles. With an increase in FDI inflows to the BRICS countries, we would expect a concomitant increase in high-tech exports. Qin et al. (2025) analyzed the impact of digital development on the bilateral trade between China and BRICS countries and examined how institutional distance contributes and how trade effects vary with digital infrastructure and economic development levels. They found that digital advancement in BRICS countries substantially boosts bilateral trade with China, highlighting technology's role in modern trade and the complexity of interactions between investments, digital capability, and economic development. We further examine these concepts below.

3. METHODOLOGY

The aim of this paper is to estimate China's role in the process of economic integration for the expanded BRICS countries, and especially its ability to lead to greater innovation in bilateral trade flows with partners. We therefore recognise China's role as an economic and political power capable of generating various direct and indirect economic effects that have an implication on its economic growth as well as that of its partners. We include all countries, partner and application countries in the empirical analysis, providing us with China and 20 partner countries (Brazil, Russia, India, South Africa, Egypt, Ethiopia, Indonesia, Iran, the United Arab Emirates, Belarus, Bolivia, Cuba, Kazakhstan, Malaysia, Nigeria, Thailand, Uganda, and Uzbekistan, Turkey, and Vietnam).

This paper contributes to the literature on investment and trade regimes and innovation by investigating whether BRICS are an empirically recognizable phenomenon resulting in increased in bilateral trade flows through innovation capabilities and FDI. The application of a structural gravity model for trade and a new and unique database (BLOCS), will enable an empirical analysis of the trade patterns of these nations in high and medium-tech industries, facilitating the formulation of trade policy recommendations and directions for future research (Yotov, 2022). The empirical gravity methodology has been recognised as one of the most robust approaches to modeling the determinants of international trade flows due to its theoretical basis and empirical success (Borchert et al. 2022). The gravity model for trade is derived from the *Law of Universal Gravity*. Its adaptation to international trade was first proposed by Poyhonen (1963) and Tinbergen (1964), who, following the postulates of Sir Isaac Newton, presented their adaptation and the first advances in the estimation of the determinants of international trade through this approach. Analogous to the *Law of Universal Gravity*, the model states that international trade between pairs of countries will be proportional to their economic masses and inversely proportional to their physical distance (Frankel, 1997). Therefore, the gravity model for trade equation is commonly expressed as follows:

(1) $$X_{ij} = \alpha_0 Y_i^{\alpha_1} \ \ Y_i^{\alpha_2} \ \ D_{ij}^{\alpha_3} Z_{ij}^{\alpha_4} \eta_{ij}$$

where, X_{ij} represents the bilateral export flows from country i to country j, $Y_i^{\alpha_1}$and $Y_i^{\alpha_2}$ represent the income or GDP of the countries as a proxy of the economic masses of the nations. $D_{ij}^{\alpha_3)}$ indicates the geographical distance between the country of origin and destination of the trade flows, and $Z_{ij}^{\alpha_4)}$ includes additional factors that may enhance or hinder bilateral trade between the parties, commonly known as multilateral resistant terms (MRTs). Following standard procedures, the gravity model considers the described control variables of interest and further considers the traditional control variables through the use of fixed effects, represented in equation 1 by η_{ij}. The inclusion of country-pair fixed effects results in it no longer being possible to estimate coefficients on time-invariant country-pair specific variables such as distance, common language, and contiguity that have been commonly included in previous gravity models. Specifically for these set of countries, regional trade agreements are also included because of the time-invariant in the sample selected. We also include explicit variables related to trade integration of the countries involved such as if the countries are members of the World Trade Organisation (WTO). Additionally, we include the product of the pair of the countries' populations, as a proxy of the consumption power of the population (Frankel and Romer, 1999). We augment this model by examining explicitly FDI as well as measures of innovation described below.

The objective of the empirical analysis is to determine whether the growing influence of the BRICS and partner countries is recognizable in their FDI exchange and whether the resulting presence of innovation is discernible in their trade patterns. Specifically, we use a newly created bilateral dataset (BLOCS) to separately identify the effects of investment and innovation in the context of their bilateral trade (Wu et al., 2024) of high- and medium-tech goods. Table 1, below, provides details of the included variables and their sources. Our data ranges from 2008-2021 as 2009 is the official start of the BRICS cooperation and 2021 is the last available year of UNCTAD data, described below. We use only the relationship with China thus generating 20 bilateral country pairs for all data.

FDI in our analysis is considered as the change to the stock, incoming or outgoing, of investments. This information is taken from the BLOCS dataset (Wu et al., 2024). Observations where the variable is zero pose a problem for log-linear estimation; as the log of zero is undefined, zero FDI flows will be dropped out of the estimation (Bacchetta et al., 2012). Following Yotov et al. (2016) and Yotov (2022), we use PPML estimation of the structural gravity model shown in equation 1. Although we are using FDI stocks and PPML methodology, we conform to current practice and those FDI observations of zero, we replace with one dollar so as not to lose potentially pertinent information. This does not actually change more than a handful of observations, so the impact of this methodology is perceived to be quite minimal. We further perform robustness checks to satisfy that our inclination in this regard is correct.

We expect that FDI should have a positive effect on the exports and imports of high- and medium-tech goods.

Table 1: Main Variables and Sources

Variable	Definition	Source
Exports or Imports	High-technology or medium technology goods exports and imports	Author calculations using BACI and UNCTAD, LALL (2000) classifications using HS-07.
Incoming FDI	Log of instock FDI (BRICS FDI to China)	BLOCS
Outgoing FDI	Log of outstock FDI (China to BRICS	BLOCS
Research and Development (R&D)	Continuous variable from 0-1 capturing R&D activities using the number of publications and patents filed on the 11 frontier technologies in a country.	UNCTAD (2025) R&D activity in the Frontier technology readiness index.
Industrial activity	Continuous variable from 0-1 capturing ongoing ongoing activities in an industry related to the use, adoption and adaption of frontier technologies.	UNCTAD (2025) Industry activity in the Frontier technology readiness index.
Interaction term	Industry activity*R&D	Author calculations
GDP	log(gdp of home*gdp of China)	BLOCS
Population	log(pop of home*pop of China)	BLOCS
WTO membership	Dummy variable of membership	BLOCS

Since we choose to estimate our results for only high and medium-tech goods, we employ the classification system for the definition of high-and medium tech traded goods which is established using the UN Trade and Development (UNCTAD) Standard Industrial Trade Classification (SITC) of products, by technological categories (Lall, 2000). Lall (2000) mapped developing countries manufactured goods export patterns, using a detailed classification by technological levels. This classification system is still used when examining global value chains of manufacturing. We used this SITC classification system, transformed to HS-07, implemented with BACI data (contained in BLOCS) in order to discern the high- and medium-technology goods exported or imported in the context of the BRICS and the extended BRICS network countries.

We are particularly interested in examining the impact of R&D activity and industry capacity on the exports and imports of these medium and high-tech goods. We retrieve these measures from the Data Hub at UNCTAD (2025). R&D activity is imperative for production of frontier technologies as well as for the modification and adjustment of these technologies for local usage. R&D activities are measured using the "number of publications and patents filed on the 11 frontier technologies in a country" (UNCTAD, 2025). It is possible that this measure undercounts the actual activity since informal R&D activities most likely occur in our sample of the BRICS. These informal activities do not necessarily result in a publication or a patent and therefore the R&D scores used probably do not reflect the actual scale of these activities.

We hypothesize that this would result in a down-ward bias in the results meaning that our results would be stronger in the direction given if these informal activities could be accounted for. We expect both R&D and industry activities to have a positive relationship with exports and imports.

Since a main indicator for high-tech manufacturing is the ability of the industry to adopt and adapt technologies for industrial use, we include an index of industry activity, also from the Data Hub at UNCTAD (2025). This measure considers three sectors that are early adopters: manufacturing, with high-tech manufacturing as the frontrunner; finance; and ICT, which tends to interact with other technologies. In developing countries, industrial activities are also sometimes performed by informal sector firms leaving their activities outside official statistics. The scores from these countries, which include our BRICS countries, are potentially lower than their actual activity might predict.

We further augment equation 1 with an interaction between industrial capacity and R&D expenditures. This is because R&D and industrial capacity for technological goods production might be reinforcing each other. R&D leads to an increase in industrial activity and an increase in industry activity would subsequently lead to increases in R&D. Therefore, both indicators would reinforce the other: to account for this possibility, we incorporate the interaction term in the second set of empirical results, shown in Table 3. Given the variables defined above, we use equation 1 to model the bilateral drivers of China's exports of high- and medium-tech goods to BRICS and BRICS enlargement countries, as well as China's imports from BRICS and BRICS enlargement countries of high- and medium-tech goods. We report our findings in the next section.

4. RESULTS

In this section, we present the main findings from the empirical regressions described above. First, the results of the initial regression are shown and described. This regression captures imports into the BRICS sphere and BRICS exports to China, and includes fixed effects for both year and country. In the second regression, in addition to the previously mentioned fixed effects, an interaction term between the R&D and Industry indicator is included. This aims to explore, within the context of international trade, the potential complementary relationship between R&D and industrial capacity in the countries that trade with China. The result of the first regression is shown in Table 2.

While Chinese FDI in partner countries does not appear to exert a significant effect on either imports from China or exports to China, BRICS countries' FDI in China shows significant results. Specifically, a 1% increase in BRICS FDI instock for China is associated with a reduction of 0.01% in imports from China for mid tech manufacturing products, and, simultaneously an increase of 0.05% in exports to China. For the case of high-tech products, no significant results are found, both for import or export.

Furthermore, R&D and industry index show significant results, as expected. In the case of the R&D index, a 1% increase in the R&D indicator in the country, implies a reduction in the imports of mid tech products from China by 0.6%. Opposite result is found for the high-tech import from China, which increases by 1,1% when the R&D index increases by 1%. When looking at the export to China, a 1% increase in the R&D index produces an increase of 1.9% in mid tech products, while no significant results are seen for high tech exports.

Table 2: Estimation of Imports from and Exports to China

	Import from China		Export to China	
	Mid tech	High tech	Mid tech	High tech
Log of instock FDI (BRICS FDI in China)	-0.01**	-0.001	0.053**	0.064
	(0.004)	(0.008)	(0.014)	(0.390)
Log of outstock FDI (Chinese FDI in BRICS)	0.033	0.010	0.035	-0.020
	(0.062)	(0.082)	(0.022)	(0.044)
R&D index	-0.597**	1.130**	1.946***	1.832
	(0.281)	(0.519)	(0.628)	(1.152)
Industry index	0.273	2.457***	4.126***	7.900***
	(0.294)	(0.608)	(0.791)	(2.177)
GDP	0.610***	0.601***	0.379***	2.510***
	(0.064)	(0.118)	(0.101)	(0.361)
Population	-0.997***	-0.756	1.175	1.138
	(0.304)	(0.570)	(0.881)	(1.662)
WTO	-0.146**	-0.040	-0.424***	0.475**
	(0.062)	(0.082)	(0.145)	(0.210)
Constant	15.474	7.387	-35.066	-127.027
	(8.412)	(15.129)	(23.093)	(46.569)
Ramsey RESET Test	0.049	0.072	0.109	0.416
N	235	235	231	231

Note: Using data as described in Table 1 and Section 3. Time and country fixed effects are included. Estimation method is PPML. Standard errors in brackets; * p<0.10 * *p < .05; *** p < .01

In the case of the industry index, it is possible to identify statistically significant and generally positive results. While the Industry Index appears to have no effect on mid-tech imports from China, it is observed that a 1% increase in the industry index leads to a 2.5% increase in high-tech imports from China. At the same time, with respect to exports to China, a 1% increase in the Industry Index would raise mid-tech exports by 4.1% and high-tech exports by 7.9%. Finally, control variables—including interactions between GDP in origin and destination countries, population interactions, and WTO membership—are included, yielding results that align with expected values. Table 3 displays the result for the estimation that includes the interaction variable between R&D and industry indicators.

Table 3: Estimation results including R&D and Industry Interaction

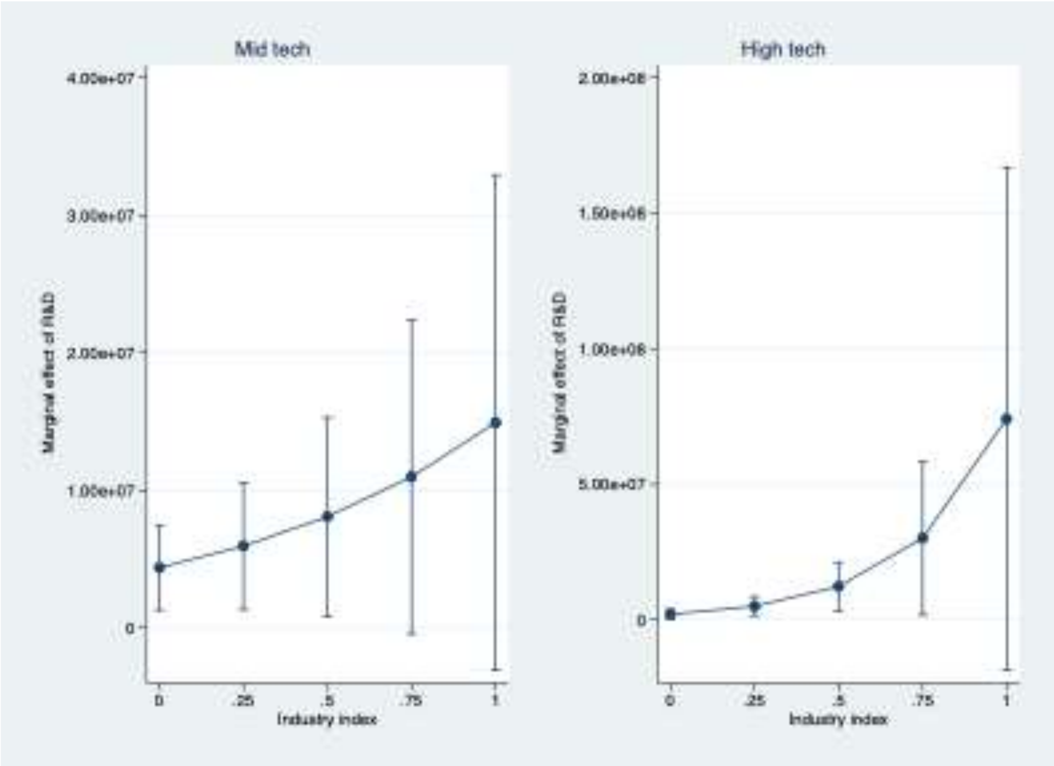
	Import from China		Export to China	
	Mid tech	High tech	Mid tech	High tech
Log of instock FDI (BRICS FDI in China)	-0.009**	-0.001	0.054***	0.069*
	(0.004)	(0.007)	(0.014)	(0.041)
Log of outstock FDI (Chinese FDI in BRICS)	0.060**	0.034	0.030	-0.034
	(0.027)	(0.046)	(0.022)	(0.048)
R&D index	1.339**	3.369**	4.748***	5.212
	(0.661)	(1.334)	(1.785)	(4.458)
Industry index	1.226***	3.598***	5.597***	9.381***
	(0.430)	(0.820)	(1.277)	(2.802)
Industry, R&D Interaction	-2.979***	-3.350*	-4.223	-4.620
	(0.952)	(1.879)	(2.584)	(5.868)
GDP	0.632***	0.610***	0.435***	2.403***
	(0.059)	(0.112)	(0.098)	(0.372)
Population	-1.377***	-1.034**	1.004	1.293
	(0.287)	(0.620)	(0.860)	(1.601)
WTO	-0.116*	-0.004	-0.375**	0.413*
	(0.060)	(0.078)	(0.147)	(0.227)
Constant	23.542	13.214	-34.122	-127.326
	(8.028)	(16.249)	(22.683)	(46.273)
Ramsey RESET Test	0.078	0.571	0.430	0.878
N	235	235	231	231

Note: Using data as described in Table 1 and Section 3. Time and country fixed effects are included. Estimation method is PPML. Standard errors in brackets; * p<0.10 * *p < .05; *** p < .01

In the case of the results presented in Table 3, similar patterns are observed for BRICS FDI in China. However, a notable difference emerges regarding Chinese FDI in BRICS countries: while previous results showed no statistical significance, the new findings indicate that greater Chinese investment is now associated with an increase in imports from China of mid-tech products. Specifically, a 1% increase in the stock of Chinese FDI is associated with a 0.06% rise in imports from China.

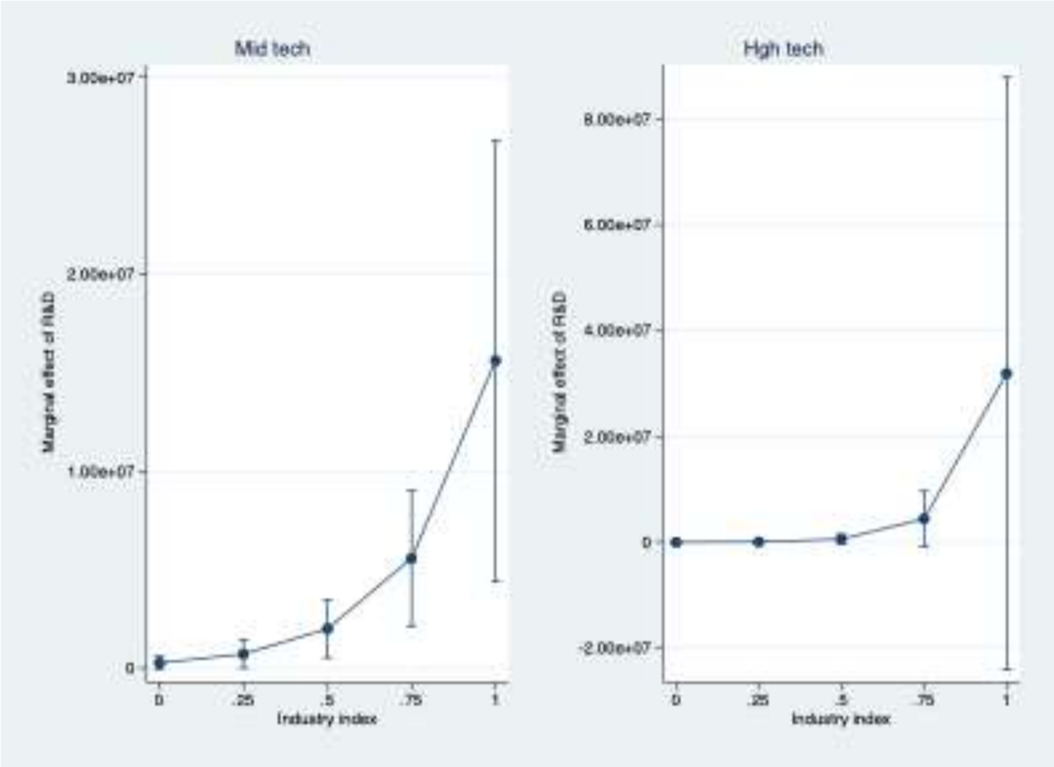
The inclusion of the interaction term between Industry and R&D index yields similar results. However, the interaction variable proves to be statistically significant, particularly in the case of imports from China. In the case of mid-tech imports, the R&D indicator now shows a positive coefficient, while the interaction term shows a negative result, probably capturing the negative effect displayed in the first estimation. This suggests that the combined effect of Industry and R&D has a negative impact, however, it is important to note that the total effect of R&D remains positive across all levels of the Industry Index (see Figure 1), since the R&D coefficient more than compensate the negative impact of the combined effect. Figure 1 shows the overall effect of the R&D Index on imports from China. As observed for mid-tech, the total effect for high-tech is also consistently positive, indicating that the negative interaction effect is more than offset by the standalone impact of R&D.

Figure 1: Marginal Effect of R&D Index on Imports by Industry index



Finally, in the case of exports from BRICS to China, the results consistently show positive coefficients for R&D (only in the case of mid-tech) and for Industry index, although none of the interaction terms are statistically significant. Nevertheless, when examining the total marginal effect of R&D, it remains positive across all levels of the Industry Index. Particularly interesting is the fact that the total effect of R&D on both mid-tech and high-tech exports becomes more substantial as the level of industrial development increases, an effect that is more pronounced for high-tech exports.

Figure 2: Marginal Effect of R&D Index on Export by Industry index



5. DISCUSSION

The expansion of the BRICS has taken on various forms and degrees of formality. Some countries have been incorporated as full members, while others have been invited to participate as associated states. Additionally, several countries have submitted formal applications to join the group. In this paper, we propose to incorporate the notion of a sphere of influence of the BRICS, referring to countries that, while not formal members, maintain political, economic, or strategic proximity to this organization. In particular, we aim to examine how this proximity may be shaping trade patterns with China, given its central economic role within the group.

Our estimations allow us to observe, on the one hand, the effects of FDI and the influence of R&D and industrial activity on trade flows. First, we consistently find that investment from BRICS countries into China is associated with a reduction in imports from China, while simultaneously increasing medium-technology exports to China. This pattern aligns with existing evidence on the organization of international trade within global value chains. For instance, in the case of BRICS FDI into China, the associated increase in exports to China may reflect transactions between firms within the same value chain, suggesting that such trade is part of integrated production processes rather than conventional trade of final goods.

Overall, the results suggest that industrial activity is a stronger determinant of trade than R&D, although both indicators of R&D remain statistically significant. At the same time, it is crucial to consider the complementarity between these two factors. A consistent pattern across our estimations is that the effect of R&D on trade with China becomes more pronounced when industrial activity is higher. This complementarity is consistent with the idea that moving up global value chains in more technologically advanced sectors requires not only the ability to invest in R&D, but also with the know-how and interdependence needed in the industrial activities that can effectively develop technological development. In other words, the effectiveness of R&D in promoting trade may depend on the existence of a robust industrial base capable of absorbing and deploying technological advances.

6. CONCLUSION

This paper contributes to the literature with several interesting findings. Using BLOCS, a unique data set, augmented with innovation and R&D data from UNCTAD, we examine Chinese trade with the BRICS countries. As the investment-innovation link not been explored much in the context of the Global South, this paper attempts to fill this gap by examining the effect of investment into the BRICS countries, concentrating on the effects of innovation on the export production of high and medium tech export goods, in the context of their trade with China. Furthermore, since not much has been written on the expanding BRICS club, we first investigated whether there is an increase of mid and high-tech exports from or toward China due to BRICS countries' investment participation. Our findings indicate that investment by BRICS countries in China reduces their imports from China and promotes BRICS exports to China, for mid-tech only.

The potential FDI contribution to technological development and R&D activities and its subsequent ability to create an innovative export effect, depends on whether the host country has reached a certain level of technological industry capacity. We were particularly interested in examining the impact of R&D activity and industry capacity on the exports and imports of these medium and high-tech goods. To this end, we included an interaction variable between R&D and industrial activity to assess their potential combined effect on trade between BRICS countries and China. One of the key findings that emerges is that the impact of R&D tends to be greater when a country exhibits a higher level of industrial capacity. These results are consistent with the patterns observed in the organization of global value chains. Trade between BRICS and China appears to be driven not only by the exchange of final goods but also by the integration of these countries into global production networks. This suggests the need for further research to better understand how engagement with China may yield benefits through participation in global value chains.

7. REFERENCES

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