Competing Roads to Africa: How BITs Reshape Japan-Africa Trade and Challenge China's Expansion*

Onur Biyik†

25 January 2026

This is still in progress. Comments are appreciated.

Abstract

As China's Belt and Road Initiative dominates headlines, Japan has quietly deployed a stealth weapon in the scramble for African influence: Bilateral Investment Treaties (BITs). But do these legal instruments actually reshape trade flows and challenge Chinese dominance? We exploit variation in Japan's BITs with African countries to provide causal estimates of their impact on trade, finding an increase of 22–36%, with the strongest effects in high-value, upstream sectors. Crucially, we uncover significant trade diversion: Japanese BITs signed reduce Chinese exports in overlapping industries by approximately $56,085. The treaties are most effective in countries like Kenya, where institutional readiness aligns with Japanese strategic interests. These results demonstrate that BITs function as dual-use policy tools, simultaneously fostering trade integration and advancing geopolitical positioning in a contested economic arena.

Keywords: BITs, Japan-Africa Trade, Geopolitical Competition, Trade Diversion, China.
JEL Classification Codes: F10, F13, F14, F21, F50.

*The author expresses gratitude for the valuable feedback and suggestions received from Kaoru Nabeshima, Emanual Forlani, Andrea Ariu, Danilo Cavapozzi and Roberto Patuelli. Additionally, the author acknowledges the contributions from Conferences such as 13th SIdE-IEA WEEE, SASE 2025 in Montreal, Advances in Spatial and Network Modelling for Policy Making, 3rd Milan PhD Economics Workshop. Their insights have greatly enriched this research. The author disclose the use of OpenAI for assistance with LaTeX table formatting and language proofreading. All conceptual and analytical content is the sole responsibility of the authors.

†Email: biyik-onur@fuji.waseda.jp, ORCID: 0009-0002-0414-3087.

1 Introduction

Bilateral Investment Treaties (BITs) are a cornerstone of the global economic order, widely recognized for reducing political risk, lowering trade costs, and stimulating cross-border investment and trade (Heid and Vozzo, 2020; Brada et al., 2021; Egger et al., 2023; Urata and Baek, 2023). Yet, in an era of escalating geoeconomic competition, a critical question arises: do these legal instruments serve a deeper, strategic purpose?[1] As major powers vie for influence across emerging markets, BITs may be evolving from neutral legal safeguards into policy instruments that actively reshape trade patterns, supply chains, and market power. This strategic dimension remains largely overlooked in the literature. While empirical studies confirm the direct, bilateral trade-enhancing effects of BITs (Xiong and Sun, 2023; Ornelas et al., 2021), they have almost exclusively examined these treaties in a vacuum. The literature has failed to systematically explore how *overlapping and competing BIT networks*, particularly in contested regions like Africa, can generate significant *trade diversion* and reallocate market shares among rival powers. This omission is critical. As Africa becomes a hub for third-party engagement, understanding BITs not just as bilateral facilitators but as instruments in a multipolar contest is essential (Coulibaly et al., 2023; Antràs et al., 2024b).

The competition between Japan and China in Africa provides a compelling setting to investigate this gap. China's presence, defined by its Belt and Road Initiative (BRI), is characterized by state-led, (debt-)financed infrastructure (Gelpern et al., 2023; van Staden, 2020). Japan, through its Tokyo International Conference on African Development (TICAD), has traditionally emphasized private-sector partnerships and sustainable development (Adem, 2023). However, beneath this developmental rhetoric lies an intensifying contest for influence. Since the (Abe) strategic foreign policy pivot in 2012, Japan has rapidly expanded its BIT network in Africa, signing treaties with seven African countries between 2013 and 2025.[2] This shift marks Japan's transition from aid diplomacy to legal-economic engagement designed to secure supply chains and counterbalance China's dominance.

We conceptualize Japan's BITs (JBITs) not merely as risk-mitigation tools, but as *dual-use policy instruments* that simultaneously foster trade integration and advance geopolitical positioning. To test

[1] We address two guiding questions: (1) To what extent do JBITs enhance Japan's trade performance in Africa, particularly in sectors aligned with its comparative advantage? (2) Do these treaties produce unintended trade diversion effects vis-à-vis China, and how do Chinese BITs (ChBITs) mediate these dynamics?

[2] Mozambique (2013/2014), Kenya (2016/2017), Côte d'Ivoire (2020/2021), Morocco (2020/2022), Angola (2023/2024), and Zambia (2025); see MOFA. Prior to 2013, only Egypt had a BIT with Japan, signed in 1977. The initiative was reinforced during the 6th and 7th TICAD summits, where Prime Minister Abe framed Africa's strategic role as central to a free and open Indo-Pacific (Nkala, 2021).

this, we employ a triangular analytical framework linking Japan, China, and African nations. Using a staggered timing design on comprehensive trade data (2010–2024), we isolate the causal effect of JBITs from confounding shocks. Our model is uniquely equipped to disentangle the direct trade effects from the indirect, competitive spillovers, controlling for China's parallel economic engagement.[3] Our findings reveal a complex geoeconomic equilibrium. We provide the first causal evidence that JBITs significantly boost Japanese exports to Africa by 22–36%, with the strongest effects in high-value, upstream sectors aligned with Japan's comparative advantage. More importantly, we also uncover clear evidence of *strategic trade diversion*: Japanese BITs are associated with a reduction in Chinese exports to the same African markets—approximately $56,000 per product. This indicates that JBITs function not only as trade facilitators but also as strategic levers that allow Japan to offset China's market share. Conversely, ChBITs generate partial positive spillovers, benefiting Japan indirectly through improved infrastructure and demand linkages.[4]

Related Literature and Contributions: These results speak to and extend several strands of the literature. First, we contribute to the empirical literature on the trade effects of BITs by moving beyond a bilateral framework to incorporate multipolar competition. While Heid and Vozzo, (2020) and Xiong and Sun, (2023) establish that BITs boost bilateral trade, their models treat each treaty in isolation, overlooking competitive interactions. Our study demonstrates that in a contested region like Africa, the signing of a Japanese BIT *not only increases Japan's exports but also reduces Chinese exports* in competing sectors. This finding of strategic trade diversion reveals a previously hidden function of BITs (in geopolitical arena) (Ornelas et al., 2021; Egger et al., 2023).

Second, we deepen the methodological and conceptual understanding of how BITs integrate partners into global value chains (GVCs). Existing studies, such as Amendolagine and Prota. (2021), focus on BITs' role in fostering local linkages within host countries. We complement this by integrating GVC metrics, specifically upstreamness and economic complexity, into a gravity-DiD framework. This allows us to show that JBITs are most effective in sectors where Japan holds a revealed comparative advantage and in *more upstream, complex industries.* This granular finding

[3]JBITs often exclude sectors dominated by Chinese state-owned enterprises (e.g., telecoms, energy), carving out niches for Japanese firms (see Figure A1). Japan's trade with Africa, particularly in intermediate goods and energy, demonstrates how BITs support integration into upstream segments of global value chains (Biyik, 2022). This role has grown in importance following disruptions such as the 2011 Fukushima disaster and the COVID-19 pandemic (Bartlett, 2022; Keiichi, 2024). Therefore, understanding the geopolitical function of BITs is both timely and policy-relevant.

[4]This finding directly connects to Amendolagine et al., (2024), showing that infrastructure-led development and GVC integration facilitate export and productivity growth in African economies. Together, these findings highlight a complex and evolving equilibrium between Japan and China's economic engagements in Africa.

underscores that the efficacy of BITs is not uniform; it is strategically channeled through sectors that reinforce the investor country's position in the upper echelons of global supply chains, a nuance that broad-brush analyses miss.

Third, we reframe BITs as dual-use tools of statecraft, bridging the international political economy and trade policy literature. Policy analysts have documented Japan's strategic pivot toward Africa (van Staden, 2020; Adem, 2023; Keiichi, 2024), yet the academic literature has lacked rigorous quantitative evidence linking this geopolitical strategy to treaty-based commercial outcomes.[5] Our paper provides this evidence, showing that JBITs are consciously deployed to "stratocracy/friend-shore" supply chains and secure strategic footholds.[6] This recasts BITs from the technical, legal instruments described in traditional literature (e.g., Egger and Merlo, (2012)) into active levers of geoeconomic strategy, a conceptual shift with profound implications for understanding modern statecraft in a fragmented global economy. Ultimately, this study demonstrates that in regions where economic opportunity and strategic competition intersect, BITs emerge as subtle yet potent instruments in the global race for influence.

The rest of this paper is structured as follows: Section 2 provides background on Japan–China geopolitical competition and BIT policy in Africa. Section 3 describes the dataset and empirical strategy. Section 4 presents the main findings. Section 5 outlines robustness checks. Section 6 concludes this study.

2 Background

Japan and China's Strategic Engagements with Africa

Africa has emerged as a critical arena for global competition, driven by its abundant natural resources and critical materials, expanding markets, and strategic geographic position within the Indo-Pacific framework. Japan and China's engagement with Africa, while sharing certain economic and political objectives, reflects divergent strategies, institutional approaches, and underlying motivations. These contrasts are rooted in broader geopolitical frameworks such as Japan's Free and Open Indo-Pacific (FOIP) and China's BRI, which shape their policies and influence on the continent (Nkala,

[5]This study addresses this gap by combining panel trade data with sector-adjusted measures, synthetic control methods, and heterogeneity-robust staggered DiD estimators, allowing us to causally identify the commercial effects of Japan's BIT strategy within a political economy framework.

[6]These effects extend beyond signatory states, producing spillovers and trade diversion that matter in a world of "reshoring" and "friendshoring" (Alfaro and Chor, 2023; Bruno et al., 2023; Jaax et al., 2023).

2021).[7] FOIP strategy and BRI exemplify their competing approaches to leveraging Africa's resources, markets, and strategic geography. Both nations have identified Africa's Indian Ocean states, such as Kenya, Tanzania, Mozambique, and Madagascar, as pivotal to their ambitions (Adem, 2023).

Chinese engagement in Africa is characterized by high-volume investment and expanding trade relations, exemplified by substantial Foreign Direct Investment (FDI) stocks and the consistent growth of exports (Gelpern et al., 2023; Onyango et al., 2025). Between 2010 and 2022 (see Table A1), China's FDI in Africa grew from $13 billion to $40 billion, peaking at $46 billion in 2018. While China's share of FDI in Africa has gradually declined relative to its global investments (from 4.1% in 2010 to 1.5% in 2022), its absolute investment volume remains significantly higher than Japan's. Chinese exports to Africa surged from $57 billion in 2010 to $128 billion in 2023, securing China's role as Africa's dominant trading partner, with Africa's share of Chinese global exports rising to 5.1% (Table A1). This reflects China's strategic commitment to infrastructure and resource-based projects under the Forum on China-Africa Cooperation (FOCAC) and BRI, such as port developments in Mozambique, Madagascar, and Kenya (van Staden, 2020).

In contrast, Japan's economic footprint in Africa remains more restrained, emphasizing multilateral cooperation, technology transfer, and sustainable development through the TICAD (Mensah, 2015; Adem, 2023). Japanese FDI stocks in Africa have oscillated between $3.7 billion and $9.5 billion during the same period, representing a consistently small proportion of Japan's total outward investment (ranging from 0.2% to 0.6%). Similarly, Japanese exports to Africa declined from $16.8 billion in 2010 to $10.5 billion in 2023, with Africa's share of Japan's global exports decreasing to 1.5% (Table A1). This cautious engagement underscores Japan's focus on sectors such as manufacturing, industrial systems, and human capital development in BITs, aligning with the TICAD and FOIP's principles of transparency and sustainability (JETRO, 2018; Hirono, 2019).

The divergence in trade and investment patterns reflects deeper strategic motivations. China's Maritime Silk Road Initiative (MSRI), a core component of the BRI, emphasizes infrastructure development in ports and transportation corridors, such as the Maputo port in Mozambique and Kenya's Lamu port. Conversely, Japan's TICAD framework, particularly under the leadership of former Prime Minister Shinzo Abe, has stressed multilateral cooperation, human development, and

[7] Building on, but departing from, the discourse analysis of Ketchley. (2025), examining how the 'China threat' is mobilized in US policy discourse, this paper shifts the analytical focus to the level of real-world policy. Our analysis, instead, examines the concrete Japanese policy implications and on-the-ground strategic engagements of Japan's FOIP as a response to this competitive environment. Thus, this represents only the Japanese perspective in line with the official documents and policymakers' speeches/news.

infrastructure investments that align with democratic and sustainable principles (van Staden, 2020). Japan's investments in projects like Mozambique's Nacala port and the Mombasa port in Kenya highlight Japan's strategic focus on facilitating regional connectivity while counterbalancing China's influence (Daimon-Sato, 2020; Nkala, 2021).

Briefly, Africa's shifting narrative—from a continent of need to a region of opportunity—has intensified competition between these two powers. For Japan, Africa is not only a source of vital natural resources with critical materials but also a platform for securing diplomatic support, such as for its UN Security Council ambitions (Mensah, 2015; Daimon-Sato, 2020). For China, Africa is not only a source of vital natural resources, but also provides a geopolitical arena to expand its influence, support its One-China policy, and reinforce its standing in global governance including UN voting for Taiwan and Hong Kong (Adem, 2023). This contest underscores the strategic importance of Africa in global value chains and geopolitics, setting the stage for evaluating how Japan's investment treaties influence trade dynamics and competition with China in this evolving landscape.

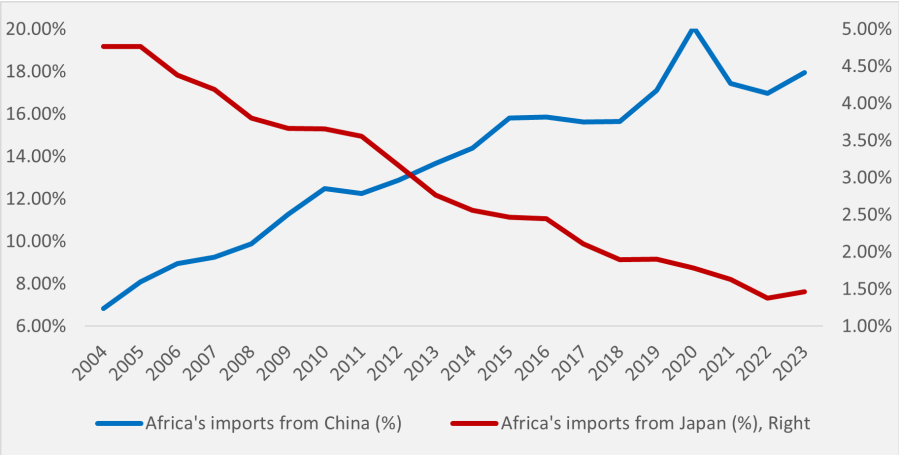
The Investment-Trade Nexus

BITs serve as crucial instruments in international economic relations, primarily aimed at facilitating investment and safeguarding the interests of overseas affiliates (Figure A1 and Table A1).[8] By mitigating trade frictions and operational costs (see Appendix B.4), BITs enhance the profitability of trade between signatory nations (Heid and Vozzo, 2020; Ornelas et al., 2021; Egger et al., 2023). This dual-purpose framework addresses the distinct objectives of both capital-importing and capital-exporting countries. For capital-importing nations, such as those in Africa, BITs are strategically employed to attract FDI, fostering economic development and integration into the global economy. Conversely, capital-exporting countries like Japan utilize BITs to protect their investors against political risks and instability in host countries, ensuring a secure environment for their overseas ventures (Egger and Merlo, 2012). This protective function is particularly significant, as it provides a layer of security that encourages investors to engage in foreign markets that might otherwise be deemed too risky.

[8]BIT's policies encompass regulations aimed at combatting corruption, ensuring protection from conflicts, safeguarding intellectual property rights, and upholding labor standards. These agreements aim to create a secure and conducive environment for investment, characterized by stability, fairness, and favorable conditions for investors. BITs also underscore the importance of health, safety, and environmental standards. Key provisions within these agreements typically include clauses related to the promotion and admission of investment, general treatment and improvement of investment environment, protection of intellectual property rights, and measures concerning health, safety, environmental standards, and labor regulations. Such articles ensure a uniform framework for liberalizing investment policies while safeguarding the interests of investors through government participation (Li et al., 2024).

Although empirical studies offer mixed evidence on the impact of BITs on FDI (Brada et al., 2021),[9] it is well-documented that BIT-related FDI can facilitate increased trade between the investor and host countries (Xiong and Sun, 2023). The investment-trade nexus suggests that FDI can function as a catalyst for trade expansion by reducing transaction costs, improving infrastructure, and fostering institutional trust between trading partners (Grossman and Rossi-Hansberg, 2008).[10] However, this positive relationship is not always reciprocal, as FDI from one country can also lead to competitive displacement effects, shifting trade patterns in favor of the investing nation while crowding out previous exporters (Baldwin and Venables, 1995; Baldwin and Okubo, 2014).

Figure 1: Share of African Imports from Japan and China (%)



Note: African imports from Japan are represented by the red line (right axis), while African imports from China are shown by the blue line (left axis). **Source:** Author's preparation.

Trade diversion, a concept rooted in the theory of customs unions (Harding and Javorcik, 2012), occurs when a shift in trade flows favors a less efficient producer due to policy interventions such as preferential trade agreements or large-scale FDI inflows that alter competitive dynamics. In the African context, China's extensive FDI and infrastructure-driven economic engagement have created new trade linkages that appear to be shifting African import demand away from traditional trading partners. Recent data illustrate the scale of China's economic involvement in Africa. In 2022, Chinese FDI stock in Africa reached $41 billion, compared to Japan's $7 billion. Trade figures reveal an even more pronounced disparity, with Chinese exports to Africa totaling $125 billion,

[9] Aligned with theoretical expectations, high-quality BITs can substantially facilitate successful overseas investments by MNEs as evidenced by positive outcomes observed for both Japan (Urata and Baek, 2023) and China (Li et al., 2024).

[10] Within the context of global and regional supply chains managed by multinational firms (MNEs), the relationship becomes considerably more complex. Firms within production networks often make integrated decisions about trade and investment. Firms export to regions where they have affiliates or headquarters, creating a complementary relationship between trade and FDI (Antràs et al., 2024a,b). For example, a company might establish a subsidiary in a foreign country and export intermediate goods to it for further processing. This involves relocating parts of the production process to different countries to take advantage of lower costs or other efficiencies (Grossman and Rossi-Hansberg, 2008).

while Japanese exports stood at $10 billion in the same year (see Table A1). The observed trends suggest that China's (aggressive) investment strategy has facilitated its dominance in African trade (Onyango et al., 2025), potentially at the expense of other competitors like Japan (see Figure 1). This trend is reinforced by China's strategic engagement through initiatives such as the BRI, which has enhanced trade-facilitating infrastructure across Africa, strengthening China's market presence while diminishing the competitiveness of other exporters (Dollar, 2016).

Details of the Japanese Investment in BIT Partners in Africa

The preceding discussion showed how China's large-scale FDI and infrastructure financing have reshaped Africa's trade patterns, expanding its export dominance while constraining Japan's market share. Yet trade outcomes alone reveal only part of this dynamic. To uncover the underlying mechanism, we turn to investment, the foundation of the trade–investment nexus. Sustained export performance often depends on outward FDI that builds production and distribution linkages abroad. In Japan's case, BITs are crafted precisely to enable this complementarity by reducing risk and encouraging firms to establish a stable local presence in partner economies.

Building on this logic, we now turn to Japanese outward FDI flows into African BIT members. Table A2 presents annual Japanese FDI outflows (100 million JPY) to these partners from 2010–2024, revealing several distinct trajectories. Kenya experienced a sharp and immediate surge in inflows in 2017 (114 billion JPY), coinciding with the entry into force of its BIT with Japan. Morocco shows a delayed but striking response, with flows rising significantly after 2020 and peaking at 84 billion JPY in 2023. In contrast, Mozambique exhibits volatile flows, while Côte d'Ivoire provides limited information. Egypt and Zambia, included as earlier and later BIT partners, show mixed and modest trends, while Angola records no observable inflows during this period (Brada et al., 2021).

These aggregate trends are further illuminated by firm-level evidence from Orbis data, which reveal the strategic composition of Japanese investments (see Appendix B.5).[11] This firm-level granularity clarifies how BITs translate into real economic linkages: they not only reduce investment risk but also strengthen trade–FDI complementarities, whereby affiliates import intermediates from

[11]In Kenya, for instance, Japanese FDI displays a dual structure: large-scale, manufacturing-oriented horizontal FDI (e.g., Toyota, Honda, and Isuzu assembly plants) and market-seeking vertical FDI (e.g., sales offices, distribution hubs, and service centers). Between 2010 and 2024, Japanese firms launched 42 projects in Kenya, with cumulative greenfield investments exceeding USD 3.5 billion and creating over 12,000 jobs. The post-2020 period also saw a strategic pivot toward digital and service sectors, with 39 M&A deals—many led by Japanese venture capital—targeting fintech, logistics, and SaaS platforms.

parent firms and extend distribution networks (Antràs et al., 2024a,b). Kenya's experience, with its strong BIT–FDI–trade correlation, exemplifies how treaties can catalyze both investment and trade when aligned with host-country readiness and sectoral diversification.[12]

3 Data and Methodology

3.1 Data

This study focuses on African countries to provide a clean identification strategy for assessing the impact of JBITs on trade. Unlike countries in regions such as the USA, EU, or ASEAN, where existing trade frameworks like EPAs, FTAs, or longstanding BITs may confound causal inference, many African nations have fewer overlapping agreements with Japan. This relative policy simplicity, combined with shared institutional and developmental characteristics across African countries, allows for a more controlled comparative analysis. By narrowing the scope to this regional context, we reduce the likelihood that our estimates are influenced by pre-existing economic alignments or trade integration levels. This approach enhances the internal validity of our findings and ensures that any observed trade effects are more likely to stem directly from the BIT policy itself, rather than from broader geopolitical or economic factors. Moreover, Japan's growing diplomatic and economic engagement with Africa, framed through initiatives like TICAD, makes this region particularly relevant for understanding the evolving role of investment treaties in trade diplomacy.

Dependent Variables: Japanese Bilateral Trade

The empirical analysis draws on bilateral trade data from the UN Comtrade Database, focusing on Japan's exports and imports at both aggregated and disaggregated levels of the Harmonized System (HS).[13] The study utilizes two datasets: HS 1-digit total volume (referred to as Panel A dataset) and HS 2-digit industry-level (referred to as Panel B dataset). These datasets are three- or four-dimensional bilateral trade datasets (countries, industries, years, months), covering the period 01/2010 to 07/2024. Panel B includes approximately 100 industries. The datasets contain a substantial number of observations, with Panel A comprising 9365 and Panel B comprising 392,214 observations

[12]Japan's BITs most visibly catalyzed investment surges in **Kenya** (see Table A2 and B6), consistent with the significant trade effects estimated in our econometric analysis. The Kenya case, in particular, demonstrates how BITs can foster deep commercial integration when supported by strategic firm-level entry and local market dynamism.

[13]The data was collected from UN Comtradeand at https://comtradeplus.un.org/. Last accessed on December 20, 2024. HS uses a coding structure where the first two digits represent the chapter (e.g., 09 for Coffee, Tea, Maté, and Spices), the next two identify subgroups, and the subsequent two offer more specific details (like 09.02.10 for Green tea). This classification is consistent across all countries up to the HS-6 level. For a more detailed view, researchers can refer to the HS classification available on the WITS platform at https://wits.worldbank.org/referencedata.html.

(Table A3). To assess GVC integration, trade values are adjusted and harmonized with two key indicators: Upstream-ness[14] and the economic complexity index[15] (see Appendix B.3).

Independent Variables:

In this study, we construct key binary variables to capture the status of BITs between Japan and African countries. The variable $JBIT_F$ is assigned a value of 1 when a BIT between Japan and an African country has entered into force, and 0 otherwise. Similarly, $JBIT_S$ is set to 1 upon the signing of a BIT, regardless of its enforcement status, and 0 otherwise (see Figure A2a). These indicators allow us to analyze the temporal effects of BITs on trade flows, distinguishing between the act of signing and the subsequent enforcement of the agreements.[16] To explore potential trade diversion effects stemming from China's economic engagements in Africa, we introduce analogous variables for Chinese BITs. The variable $ChBIT_F$ equals 1 when a BIT between China and an African nation has entered into force, while $ChBIT_S$ is set to 1 upon the signing of such a treaty (Figure A2b). Incorporating these variables allows us to assess how China's BITs could influence Japan's trade dynamics with African countries, considering China's expanding footprint in the region.

Recognizing the pivotal role of China's economic engagement in Africa, we incorporate data on Chinese trade volumes at both the HS-1 and HS-2 classification levels to control for confounding influences and better contextualize Japan's trade relations. Including Chinese trade flows allows us to examine whether China's presence in African markets complements or competes with Japan's commercial interests.[17] Furthermore, to capture potential strategic interactions, we introduce an interaction term between Japanese BITs ($JBIT$) and Chinese trade volumes. This interaction term

[14]The Upstream-ness index, developed by Antràs et al., (2012), measures an industry's distance from final use, with higher values reflecting earlier stages in the value chain. We map these values onto HS 2-digit classifications covering roughly 100 sectors, using data adapted from U.S. input-output tables and extended through global sources to reflect Japan's trade with African economies.

[15]The Economic Complexity Index (ECI), provided by the Harvard Atlas of Economic Complexity, measures the knowledge intensity of an economy based on the diversity of products it exports and the ubiquity of those products across countries. Higher ECI values indicate more complex export structures and greater productive capabilities, presenting technological sophistication.

[16]A key concern is whether JBITs are endogenous to trade flows. Event-study tests of the parallel trends assumption show no significant pre-treatment effects (see Figure A3), reducing reverse-causality concerns. Moreover, Japan's BITs were driven largely by geopolitical strategy under TICAD rather than existing trade volumes, supporting their plausibly exogenous role in our design.

[17]One concern is potential reverse causality between Chinese and Japanese trade flows. While our model allows Chinese exports or imports to influence Japan's trade outcomes, the reverse channel is less plausible given the structural asymmetries in Africa: China's FDI and trade volumes are substantially larger, its BIT network more extensive, and its engagement predates Japan's recent initiatives (see Table A1 and Figure A2b). These differences, together with Japan's late and selective BIT adoption under TICAD, support the assumption that Chinese flows and BITs ($ChBIT$) are exogenous to Japan's trade dynamics.

allows us to investigate whether the enforcement of Japan-Africa BITs, in the context of China's active trade engagement, has synergistic or diversionary effects on Japan's exports to the region. By integrating these variables and analytical tools, our study aims to offer a comprehensive evaluation of the factors influencing Japan-Africa trade relations, accounting for the multifaceted impacts of BITs and the broader geopolitical economic landscape.[18]

3.2 Regression Specification

Building upon established methodologies in the trade and BIT literature (Heid and Vozzo, 2020; Xiong and Sun, 2023) and the conceptual framework outlined in Appendix B.4, this study employs both Ordinary Least Squares (OLS) and Poisson Pseudo-Maximum Likelihood (PPML) estimators to evaluate the impact of Japan-Africa BITs on trade flows, accounting for both direct impacts and competitive interactions with China-Africa BITs.[19]

Linear (OLS) and Non-Linear ($PPML$) Specifications:

$$JpTra_{iptm} = \beta_1^{TWFE} JBIT_{iptm} + \beta_2 ChBIT_{iptm} + \beta_3 ChTra_{iptm} + \beta_4 X_{iptm} + \delta_{ip} + \delta_{tm} + \epsilon_{iptm} \tag{3.1}$$

$$JpTra_{iptm} = \exp\left(\beta_1^{TWFE} JBIT_{iptm} + \beta_2 ChBIT_{iptm} + \beta_3 ChTra_{iptm} + \beta_4 X_{iptm} + \delta_{ip} + \delta_{tm}\right) \cdot \epsilon_{iptm} \tag{3.2}$$

where i indexes African partner countries, p denotes products, t refers to years, and m to months. The dependent variable $JpTra_{iptm}$ captures Japan's exports (or imports) at the product level. The key policy variables are: $JBIT_{iptm}$, which measures the presence of a Japan-Africa BIT; $ChBIT_{iptm}$, which captures China's BITs with African countries; and $ChTra_{iptm}$, which proxies Chinese trade flows with those partners. Additionally, X denotes the interaction term (JBIT#ChExp) between $JBIT$ and Chinese trade volumes, allowing for the assessment of whether the scale of Chinese trade engagement conditions the impact of Japanese BITs. Fixed effects are applied at multiple levels: δ_{ip} addresses country-product-specific unobserved heterogeneity, while δ_{tm} accounts for temporal shocks shared across years and months. The error term captures idiosyncratic deviations.

The coefficient β_1 identifies the direct trade-enhancing effect of Japanese BITs. The terms β_2 and β_3 capture the influence of China's treaties and trade presence, while β_4 on the interaction term

[18] To assess potential trade diversion and offer a balanced perspective, we further analyze China's position in African trade under its own BIT network. This comparative analysis is detailed in Appendix B.2 and helps clarify the distinct roles of Japanese and Chinese BITs in shaping bilateral trade outcomes.

[19] A simplified identification strategy, linking trade, FDI, and third-country spillover effects, is outlined in equation (B4.8. OLS provides a straightforward linear benchmark, while PPML addresses heteroskedasticity and the prevalence of zero trade flows, which are common in highly disaggregated trade data.

reflects the strategic interplay between Japan and China in African markets. In practice, however, the overlap of Japanese and Chinese BITs within our sample window is minimal (limited primarily to Angola), making such estimates fragile and potentially misleading.[20] In essence, the model evaluates how JBITs, traditionally linked to investment, enhance economic relations through trade integration and assesses potential trade diversion effects, considering the integration of JBIT members with China and vice versa.[21]

This baseline specification adopts a two-way fixed effects (TWFE) framework, which provides a useful starting point under the assumption of homogeneous treatment effects. However, it is well-established that TWFE can yield biased estimates in staggered-adoption settings if treatment effects are heterogeneous across cohorts or time (Goodman-Bacon, 2021; Borusyak et al., 2024). To address these concerns, we complement our baseline with heterogeneity-robust difference-in-differences and synthetic control estimators (see Appendix B.1).[22] These extensions allow us to capture more accurately the dynamic and heterogeneous impacts of Japanese BITs on trade.

4 Empirical Result

Two central insights emerge from Section 2, prompting deeper empirical exploration: (1) how the investment-trade nexus manifests itself across African markets, and (2) whether Japanese BITs indirectly trigger a trade diversion effect toward China. To address these points, this section investigates Japanese trade flows with Africa.

Baseline Estimations: Table 1 presents baseline estimates of the impact of Japan-Africa BITs on Japan's trade with African countries by employing both linear (OLS) and nonlinear (PPML) estimators. The results confirm that BITs significantly boost Japanese exports to Africa. The coefficient on the BIT treatment variable (JBIT) is positive and statistically significant at the 1% level across all specifications

[20] While Angola provides one case where both a JBIT and ChBIT were signed during the study period, in most other instances China's treaties either predate Japan's by decades (e.g., Egypt, Morocco, Mozambique) or were not yet enforced (See Figure A2). Introducing an interaction term would therefore rely almost entirely on Angola's signed effect. For this reason, we focus on the separate effects of JBITs and ChBITs, while the competitive interplay between them is analyzed through trade diversion and spillover mechanisms. Results with an interaction term for signed were explored with the limited overlap under fixed effects; these are available upon request.

[21] To examine this strategic interplay, we further analyze China's position in African trade under its own BIT network, as presented in Appendix B.2.

[22] Standard TWFE DiD estimators implicitly construct counterfactuals by comparing newly treated units with already treated ones, which can induce negative or distorted weights when treatment effects vary by cohort (De Chaisemartin and d'Haultfoeuille, 2020; Goodman-Bacon, 2021). This is a crucial concern because the empirical design follows a staggered DiD framework, where African countries progressively adopt BITs with Japan at different points in time (Callaway and Sant'Anna, 2021; Borusyak et al., 2024).

(Columns 1-2). Specifically, after controlling for country and period fixed effects, JBIT is associated with an average export increase of approximately 35.9% (i.e., $[\exp(0.307) - 1] \times 100$)—equivalent to a revenue gain of roughly $6.2 million, holding other factors constant. This magnitude aligns closely with prior evidence from Heid and Vozzo, (2020), who report PPML estimates in the range of 0.250 to 0.352. Additionally, Figure A3 simply plots the impact of Enforced ($JBIT_F$) and Signed ($JBIT_S$) BITs on Japan's trade with Africa, where $JBIT_F$ shows a clearly increasing positive impact after the transaction, but no significant impact in the pre-transaction period. This supports the theoretical premise that BITs reduce uncertainty, promote investor confidence, and solidify long-term commercial relationships (Egger et al., 2023).

Table 1: Baseline Estimates of Japanese Trade with Africa

Dependent Variable	Japanese Export Value							
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	BIT Enforced				**BIT Signed Only**			
JBIT	6.233***	0.307***	7.080***	0.314***	4.850***	0.297***	5.585***	0.304***
	(1.171)	(0.0481)	(1.208)	(0.0477)	(1.101)	(0.0475)	(1.131)	(0.0471)
ChBIT	5.981***	0.424***	5.921***	0.421***	5.849***	0.411***	5.762***	0.408***
	(0.587)	(0.0396)	(0.590)	(0.0399)	(0.837)	(0.0491)	(0.845)	(0.0493)
ChExp	-0.0003	-0.0003***	-0.0001	-0.0003***	0.0005	-0.0003***	0.0008	-0.0003***
	(0.0015)	(0.0001)	(0.0015)	(0.0001)	(0.0015)	(0.0001)	(0.0016)	(0.0001)
JBIT#ChExp			-0.056**	-0.0007*			-0.054**	-0.0008*
			(0.0241)	(0.0004)			(0.0238)	(0.0004)
Pseudo/R^2	0.799	0.885	0.799	0.885	0.799	0.885	0.799	0.885
Dependent Variable	Japanese Import Value							
JBIT	9.711***	0.626***	13.90***	0.989***	7.942***	0.450***	11.39***	0.743***
	(1.682)	(0.0797)	(1.659)	(0.114)	(1.735)	(0.0735)	(1.629)	(0.109)
ChBIT	8.420***	0.309***	8.150***	0.300***	0.171	-0.222**	-0.330	-0.268***
	(1.167)	(0.0877)	(1.224)	(0.0879)	(1.172)	(0.0988)	(1.349)	(0.103)
ChImp	-0.0046	-0.0001	-0.0008	-0.0001	-0.0046	-0.0001	-0.0011	-0.0001
	(0.0091)	(0.0001)	(0.0106)	(0.0001)	(0.0091)	(0.0001)	(0.0111)	(0.0001)
JBIT#ChImp			-0.025**	-0.0010***			-0.020	-0.0008***
			(0.0122)	(0.0003)			(0.0127)	(0.0002)
Pseudo/R^2	0.817	0.861	0.817	0.861	0.816	0.861	0.816	0.861
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,365	9,365	9,365	9,365	9,365	9,365	9,365	9,365

Notes: Columns (1–4) report BITs that entered into force, and Columns (5–8) include signed BITs yet to be enforced. Interaction terms (JBIT#ChExp / JBIT#ChImp) capture trade diversion effects towards China. All models include bilateral (country as δ_i) and time (year-month as δ_{tm}) fixed effects. ***, **, * represent significance at 1%, 5%, and 10% levels respectively. Robust standard errors are reported in parentheses. **Source:** Author's calculation.

Beyond this direct effect, we investigate how the efficacy of Japanese BITs may be conditioned by the parallel rise of China as a strategic economic actor in Africa. To capture this dynamic, we include

interaction terms between Japanese BITs and China's trade levels (i.e., $JBIT\#ChExp$ reported in Columns 3-4). The negative and statistically significant coefficients on these interaction terms suggest that Japanese BIT members are somewhat less effective in markets where China is already commercially entrenched. For example, materials exports from China decline by approximately $56,085 for each Japanese BIT signed—an indication of potential trade diversion (Column 3). These findings imply that JBITs may function not only as facilitators of bilateral trade but also as strategic instruments that allow Japan to offset China's export share in overlapping African markets. To further examine this strategic interplay, we turn to Chinese trade patterns with Africa, as presented in Appendix B.2. There, we find evidence that BIT participation by Japan is associated with a negative effect on Chinese trade volumes (Table B4).[23]

Finally, Table 1 also explores the reverse linkage, whether China's BITs ($ChBIT$) with African countries affect Japan's trade. The results (see Columns 1–2) show a positive and significant relationship between ChBIT enactment and Japan's trade flows, implying that enhanced Chinese engagement with Africa may indirectly benefit Japanese exporters as well, potentially through improved infrastructure, logistics, or regional demand spillovers.[24] These results align with recent studies showing that infrastructure-led development and GVC integration facilitate export and productivity growth in African economies (Amendolagine et al., 2024).

What Drive Japanese Output: Sectoral Heterogeneity

Building on the baseline results, we next explore sectoral heterogeneity by examining how Japan-Africa $BITs$ operate across different industries, particularly those subject to investment restrictions. As shown in Figure A1, many $BITs$ explicitly exclude certain sectors from investment liberalization, meaning their effects may vary depending on industry coverage. In light of this, and consistent with the integrated nature of production supply chains, we first assess the impact of $BITs$ on all sectoral trade, ignoring the restricted-industry exclusions in Table 2. Across all model specifications, Japanese

[23]We observe a relatively small coefficient (e.g., 0.0007) in Column 4, which is largely driven by the substantial scale of Chinese exports to Africa. To better assess the real impact of Japanese BIT members' interaction with Chinese trade, the coefficient for $JBIT_F$ in Table B4 provides a more meaningful interpretation, showing a sizeable and statistically significant effect (e.g., -10.91) that reflects the practical magnitude of trade diversion associated with China's presence. Taken together, this underscores a competitive dynamic in which JBITs serve both as trade-promoting instruments and geopolitical tools of market positioning.

[24]Table B4 presents the direct effects of $ChBIT$ on China–Africa trade. Taken together, the findings suggest that $ChBIT$s not only boost China's trade with African countries but also yield indirect spillover effects that enhance Japan's commercial engagement in the region, reflecting a triangular interdependence between Japan, China, and Africa as positive externalities under certain conditions.

BITs, particularly those that have entered into force, are positively and significantly associated with Japanese exports to Africa (see columns 1-2). For instance, the coefficient on JBIT_F ranges from 1.497 to 1.688 in the OLS models, and from 0.296 to 0.301 in the PPML estimates.

Table 2: Baseline Estimates of Japanese Sectoral Trade Value (JTra)

Dependent Variable	Japanese Export Value							
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	BIT Enforced (JBIT_F)				**BIT Signed Only (JBIT_S)**			
JBIT	1.497***	0.296***	1.688***	0.301***	1.461***	0.314***	1.676***	0.323***
	(0.218)	(0.0417)	(0.236)	(0.0418)	(0.209)	(0.0397)	(0.228)	(0.0400)
ChExp	-0.00661***	-6.12e-06	-0.00574***	-1.02e-06	-0.00664***	-9.16e-06	-0.00561***	-2.50e-07
	(0.00158)	(2.29e-05)	(0.00173)	(2.32e-05)	(0.00158)	(2.28e-05)	(0.00177)	(2.31e-05)
JBIT#ChExp			-0.00603*	-3.85e-05			-0.00620*	-6.40e-05
			(0.00358)	(5.10e-05)			(0.00333)	(5.03e-05)
Observations	392,069	256,385	392,069	256,385	392,069	256,385	392,069	256,385
Pseudo/R^2	0.733	0.911	0.733	0.911	0.733	0.911	0.733	0.911
Dependent Variable	Japanese Import Value							
JBIT	1.425***	0.410***	1.364***	0.410***	1.379***	0.341***	1.324***	0.341***
	(0.237)	(0.0768)	(0.259)	(0.0768)	(0.240)	(0.0733)	(0.257)	(0.0733)
ChImp	-0.0162***	-7.13e-05***	-0.0163***	-7.13e-05***	-0.0162***	-7.10e-05***	-0.0163***	-7.11e-05***
	(0.00502)	(1.84e-05)	(0.00504)	(1.85e-05)	(0.00502)	(1.84e-05)	(0.00504)	(1.84e-05)
JBIT#ChImp			0.0255	1.20e-05			0.0256	1.67e-05
			(0.0417)	(0.000169)			(0.0416)	(0.000169)
Observations	392,069	175,679	392,069	175,679	392,069	175,679	392,069	175,679
Pseudo/R^2	0.667	0.919	0.667	0.919	0.667	0.919	0.667	0.919
Panel B	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2
FE (δ_{ip}, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1–4) correspond to BITs that have entered into force, while Columns (5–8) relate to signed BITs not yet enforced. Interaction terms (JBIT#ChExp / JBIT#ChImp) capture trade diversion effects towards China. All models include bilateral (country-industry as δ_{ip}) and time (year-month as δ_{tm}) fixed effects. ***, **, * represent significance at 1%, 5%, and 10% levels respectively. Robust standard errors are reported in parentheses. **Source:** Authors' calculation.

To assess the impact of sector-specific restrictions within BITs, we refined our analysis to focus exclusively on industries explicitly excluded from BIT commitments. By reconstructing the BIT variable to represent only these sectors, the results, detailed in Table A5, reveal that even within this constrained sample, enforced BITs maintain a positive and statistically significant correlation with Japanese exports (columns 1–2). Notably, the coefficient for BITs is reduced when sectors excluded from the agreements are omitted from the analysis. This suggests that inter-sectoral input-output dynamics play a crucial role; sectors facing investment restrictions often rely on outputs from unrestricted sectors, thereby facilitating trade across the broader economy. The interconnected nature of these sectors implies that the overall economic impact of BITs extends beyond the directly targeted industries. Consequently, a comprehensive understanding of input-output relationships among sectors is essential for accurately evaluating the effectiveness of BITs.

Lastly, the interaction terms between Japanese BITs and China's exports ($JBIT\#ChExp$) reveal a notable insight into the competitive dynamics of trade in Africa. This finding reinforces the earlier results from Table 1, offering evidence of a potential trade diversion effect. Overall, Japan's BITs with African nations are consistently associated with increased bilateral trade flows, both in aggregate and within sector-specific contexts. These outcomes underscore the dual function of BITs: while they serve as legal mechanisms to safeguard investment—through provisions such as dispute resolution and national treatment—they also operate as instruments of economic diplomacy in an increasingly competitive and multipolar trade environment in Africa.

5 Robustness Analysis

Confidence Estimates (Resampling): To improve the reliability of our statistical inference, we employ imputation techniques grounded in heteroskedasticity-robust variance estimation, as recommended by MacKinnon et al., (2023) and Hansen, (2025). Specifically, we utilized jackknife and bootstrap robust methods across both linear and nonlinear estimations to account for potential error structure misspecification. The aggregated results at the HS-1 level are presented in Table 3, while Table A6 details the sectoral heterogeneity at the HS-2 level, capturing heterogeneity across industries. Across all specifications (columns 1–8), Japanese BITs that have entered into force are consistently associated with significant increases in both exports and imports, reinforcing the robustness of our baseline results (Tables 1 and 2).

Country-level estimates further highlight variation in the effectiveness of BITs, a pattern that becomes clearer when examining the nature of associated FDI. For instance, Kenya and Côte d'Ivoire show strong export effects, while Mozambique and Kenya display significant impacts on import flows-distinction visualized through the causal estimates presented in Figures B7 and B8. The firm-level evidence from Orbis suggests this trade dynamism is closely linked to vertical, market-seeking FDI and large-scale horizontal FDI, both of which create trade channels (see Appendix B.5).[25] In contrast, results for countries such as Morocco, which attracted a significant but later surge of potentially different investment types, were initially statistically insignificant for trade, suggesting that the efficacy of BITs depends not just on the volume of FDI, but on its structure, alongside institutional readiness, trade complementarities, and the timing of implementation.

[25]Specifically, affiliates established under these investment types are more likely to import intermediates from parent firms and strengthen distribution networks, directly boosting import and export flows (Antràs et al., 2024a,b).

Table 3: Aggregated Result of BIT Enforced with Imputation Method

Dependent Variable	**Japanese Export**				**Japanese Import**			
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	Bootstrap		**Jackknife**		**Bootstrap**		**Jackknife**	
JBIT_F	6.233***	0.307***	6.233***	0.307***	97.11***	0.626***	97.11***	0.626***
	(1.1630)	(0.0560)	(1.1873)	(0.0587)	(16.41)	(0.0797)	(17.25)	(0.0938)
	Estimation of Country Result							
Egypt	–	–	–		–	–	–	
Mozambique	3.663*	0.168	3.663*		200.8***	1.946***	200.8***	
	(2.026)	(0.143)	(2.0481)		(17.04)	(0.217)	(15.44)	
Kenya	13.16***	0.361***	13.16***		84.78***	0.594***	84.78***	
	(2.842)	(0.0636)	(2.7358)		(26.31)	(0.119)	(24.33)	
Côte d'Ivoire	2.904***	0.363***	2.904***		-1.115	0.0526	-1.115	
	(0.967)	(0.0958)	(0.8872)		(15.43)	(0.143)	(8.985)	
Morocco	1.740	0.100	1.740		81.59*	0.258**	81.59*	
	(1.607)	(0.0854)	(1.4766)		(42.52)	(0.131)	(42.79)	
Exogenous Variables								
ChBIT_F	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ChExp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bootstrap	Yes	Yes	No	No	Yes	Yes	No	No
Jackknife	No	No	Yes	Yes	No	No	Yes	Yes
Observations	9,365	9,365	9,365	9,365	9,365	9,365	9,365	9,365

Note: Columns (1-4) present Japanese export to Africa using both linear and nonlinear models to address heteroskedasticity and potential bias. Columns (1-2) report OLS and PPML results with bootstrap clustering at the partner level (MacKinnon et al., 2023), while Columns (3-4) use jackknife standard errors for both estimation methods, enhancing inference robustness per Hansen (2024). Columns (5-8) replicate this framework for Japanese imports to assess asymmetries in BIT effectiveness on export vs. import dynamics. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are reported in parentheses. **Source:** Author's calculations.

Causal Estimates: To address potential biases inherent in the TWFE model, we further adopt a staggered DiD and synthetic control analysis, following recent methodological advances (Abadie. 2005; Wooldridge, 2023; Borusyak et al., 2024; Nagengast and Yotov, 2025). The extended TWFE (ETWFE) model, detailed in Appendix B.1, yields results consistent with our baseline specifications and reinforces the credibility of our causal interpretation (See Table B1). Moreover, Tables B2 and B3 present a series of robustness checks that account for key econometric concerns identified in the literature, confirming the stability of JBIT effects across different specifications.[26] Lastly, we verify our results using the synthetic control method (Arkhangelsky et al., 2021). As illustrated in Figure B6 (based on monthly data), Kenya's exports diverge upwards from their synthetic counterfactual following the BIT's enforcement, providing clear visual and statistical evidence that the treaty

[26]We explicitly address concerns regarding unconditional parallel trends (Figure B4) and potential violations of the parallel trends assumption (Figure B5), as suggested in the literature (Baker et al., 2025).

generated export growth which would not have occurred otherwise.[27]

Upstreamness and Economic Complexity: Global production today involves multiple stages across borders, with multinational enterprises (MNEs) strategically locating affiliates to optimize sourcing and production efficiency.[28] This structure implies that trade activities are shaped by firm-level decisions tied to comparative advantage and GVC participation. Empirical studies have shown that MNE exporters tend to concentrate trade flows in regions where their affiliates operate, particularly within high-value segments of GVCs (Carballo et al., 2023; Conconi et al., 2024). Building on this framework, our analysis incorporates GVC-related indicators, namely upstreamness and economic complexity (see details on these indices in Appendix B.3), to evaluate the impact of Japanese BITs on trade intensity and sectoral positioning. As reported in Table B5, the consistently positive and statistically significant coefficients on $JBIT_F$ across both export and import models suggest that Japan's BITs enhance its integration into African production networks, particularly by strengthening its role in more upstream and technologically or economically complex sectors.

Comparative Advantage (BRCA): To complement the analysis of GVC, we use the Balassa Index to compute the Revealed Comparative Advantage (BRCA) at the sector level.[29] This allows us to evaluate whether JBITs are particularly effective in sectors where Japan holds structural strengths (French, 2017). As shown in Table 4, JBITs significantly boost Japanese exports and imports in sectors where Japan already demonstrates comparative advantage (i.e., $BRCA(Jp) = 1$), affirming that BITs are strategically aligned with Japan's industrial strengths. The baseline estimates with sample of $BRCA(Jp) = 1$ show strong, positive coefficients on $JBIT_F$ (Columns 1–2). As for Chinese BIT memebers, while China's BITs (ChBIT_F) enhance export performance but negatively affect Japan's imports, suggesting possible friction or crowding-out in supplier sectors.

Moving to Columns (3–4) with sample of $BRCA(Jp) = 1$, the interaction terms between JBITs and Chinese trade flows ($JBIT\#ChExp$, $JBIT\#ChImp$) confirm modest trade diversion in the export channel, where Japan's BIT-enabled gains appear to come at China's expense in overlapping

[27]We further explore the robustness and heterogeneity of this result by aggregating the data to an annual frequency and applying complementary synthetic control estimators (FDID and SCUL). As shown in Figures B7 and B8, Kenya exhibits robust positive effects on both export and import margins, consistent with its diversified economic engagement with Japan. In contrast, partners like Côte d'Ivoire and Mozambique display more asymmetric responses, aligning with their distinct sectoral and institutional profiles. This extended analysis confirms the core finding while clarifying the conditions under which BITs are most effective.

[28]This is clearly illustrated in the case of Japanese FDI into Kenya (see Appendix B.5), where strategic investments in horizontal FDI (e.g., Toyota assembly plants) leverage Japan's RCA in manufacturing, while vertical FDI (e.g., sales and distribution hubs) deepens GVC integration and shapes trade flows in both intermediates and final goods.

[29]The BRCA index compares a country's share of world exports in a given sector to its overall share of world exports. The RCA value greater than 1 indicates a comparative advantage in that sector (French, 2017; Jones et al., 2023).

markets for Japanese export. The most nuanced insights emerge when full sample specifications are used (Columns 5–6), where the effectiveness of JBITs is analyzed through the lens of BRCA. The interaction term, $JBIT\#BRCA(Jp)$, is strongly positive and statistically significant across both exports and imports, indicating that JBITs are most effective in sectors where Japan already possesses a comparative advantage. This likely reflects Japan's ability to leverage existing technological strengths, production capabilities, and established trade networks to expand its position in Africa.

Table 4: Revealed Comparative Advantage (RCA) and BIT Impacts on Japan-Africa Trade

Dependent Variable	**Japanese Export Value**					
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML
Japanese Export Value						
JBIT_F	13.06***	0.309***	15.49***	0.330***	-0.834***	-0.629***
	(2.111)	(0.0447)	(2.261)	(0.0448)	(0.218)	(0.0604)
ChBIT_F	12.16***	0.405***	11.92***	0.398***	1.276***	0.375***
	(1.384)	(0.0384)	(1.384)	(0.0389)	(0.128)	(0.0370)
ChExp	-0.0147***	-7.03e-05*	-0.0104*	-4.89e-05	-0.00696***	-1.49e-05
	(0.00550)	(3.83e-05)	(0.00593)	(3.90e-05)	(0.00158)	(2.27e-05)
JBIT#ChExp			-0.0296**	-0.000154*		
			(0.0124)	(7.96e-05)		
JBIT#BRCA(Jp)					19.51***	1.188***
					(1.129)	(0.0472)
JBIT#BRCA(Ch)					0.995***	-0.0522
					(0.289)	(0.0422)
Observations	37,381	37,381	37,381	37,381	392,069	256,385
Pseudo R^2	0.749	0.919	0.749	0.919	0.734	0.914
Dependent Variable	**Japanese Import Value**					
JBIT_F	0.763	0.684**	0.770	0.647**	-0.0254	-2.343***
	(0.473)	(0.301)	(0.484)	(0.315)	(0.284)	(0.116)
ChBIT_F	-0.145	-1.612***	-0.145	-1.609***	1.418***	0.209**
	(0.292)	(0.426)	(0.292)	(0.426)	(0.257)	(0.0908)
ChImp	0.0345	0.000136	0.0346	0.000134	-0.0162***	-7.07e-05***
	(0.0454)	(0.000137)	(0.0458)	(0.000137)	(0.00502)	(1.84e-05)
JBIT#ChImp			-0.00631	0.00322		
			(0.0524)	(0.00318)		
JBIT#BRCA(Jp)					15.97***	3.212***
					(1.248)	(0.0825)
JBIT#BRCA(Ch)					-2.697**	-0.168
					(1.330)	(0.105)
Observations	37,381	15,312	37,381	15,312	392,069	175,679
Pseudo R^2	0.749	0.919	0.749	0.919	0.734	0.914
Sample (HS-2)	BRCA(Jp)=1	BRCA(Jp)=1	BRCA(Jp)=1	BRCA(Jp)=1	Full Sample	Full Sample
FE (δ_{ip}, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes

Note: BRCA(Jp) and BRCA(Ch) are dummies equal to 1 if Japan or China has RCA > 1 in a sector. Columns (1–2) report baseline results; (3–4) include JBIT×China trade interaction; (5–6) report BRCA-based interaction effects. ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively. Standard errors in parentheses. **Source:** Author's calculations.

Meanwhile, Column 5 shows that the interaction term $JBIT\#BRCA(Ch)$ is significantly

positive for exports but negative for imports. This asymmetric pattern suggests that when China dominates a sector, Japanese BITs tend to facilitate exports to Africa, possibly by integrating into complementary segments of of regional value chains or through product differentiation that avoids direct competition. In contrast, the negative effect on imports implies trade diversion—Japanese BITs may reduce African imports from sectors where Chinese firms, particularly state-owned enterprises, already have a strong foothold, reflecting intensified competitive dynamics and potential market displacement.[30] To conclude, JBITs significantly increase trade in sectors where Japan holds a comparative advantage, likely reflecting Japan's ability to leverage integrated supply chain dynamics and intra-industry trade linkages, particularly in high-tech, machinery, and capital-intensive goods (Table B5). These findings underscore the strategic role of BITs not only as legal instruments that reduce investment risks, but also as policy tools to consolidate Japan's competitive position, deepen its integration into African value chains, and selectively manage competitive pressures from China.

6 Conclusion

This study demonstrates that Japan-Africa BITs play a meaningful role in promoting bilateral trade, extending their function beyond investment protection toward trade integration. Through robust empirical analysis, such as leveraging panel data, trade-adjusted sectoral metrics, synthetic control, and heterogeneity-aware DiD estimators, we find that enforced Japanese BITs consistently stimulate exports and imports, especially in industries where Japan holds a revealed comparative advantage. Importantly, these effects persist even after accounting for Chinese trade presence and institutional variations across African countries. The findings suggest that BITs can serve as effective policy tools for enhancing economic ties in strategic regions, particularly when aligned with national comparative advantages and broader geopolitical goals. However, the observed trade diversion patterns vis-à-vis China also highlight the competitive undercurrents embedded in contemporary trade diplomacy. As such, this research contributes to a more nuanced understanding of BITs as both economic and geopolitical instruments, informing the future design of trade and investment policies in multipolar global contexts.

[30]This interpretation aligns with documented evidence of sector-specific investment restrictions in Japanese BITs, which often explicitly exclude industries where Chinese state-owned enterprises dominate, such as telecommunications and energy (Figure A1). It is also noteworthy that when zero-trade flows are accounted for using PPML estimator, Column 6 reveals that the $JBIT\#BRCA(Ch)$ interaction becomes insignificant and negative for both exports and imports. This reinforces the interpretation that Japan's BIT-driven trade effects are weakened, or even constrained, in sectors where China's dominance is overwhelming.

References

Abadie, A. (2005) Semiparametric difference-in-differences estimators. *The review of economic studies*, 72(1), 1-19.

Adem, S. (2023). Sino-Japanese Rivalry in Africa? In *Africa's Quest for Modernity: Lessons from Japan and China* (pp. 141-160). Cham: Springer International Publishing.

Alden, C., and Large, D. (2015). On becoming a norms maker: Chinese foreign policy, norms evolution and the challenges of security in Africa. *The China Quarterly*, 221, 123–142.

Alfaro, L., and Chor, D. (2023). Global supply chains: The looming "great reallocation". *NBER Working Paper No. w31661*.

Amendolagine, V., and Prota, F. (2021). Bilateral investment treaties and backward linkages in Sub-Saharan Africa. *International Economics*, 165, 172-185.

Amendolagine, V., Presbitero, A. F., and Rabellotti, R. (2024). Chinese infrastructure lending in Africa and participation in global value chains. *Review of World Economics*, 1-42.

Antràs, P., Chor, D., Fally, T., and Hillberry, R. (2012). Measuring the upstreamness of production and trade flows. *American Economic Review*, 102(3), 412-416.

Antràs, P., Fadeev, E., Fort, T. C., and Tintelnot, F. (2024a). Exporting, global sourcing, and multinational activity: Theory and evidence from the United States. *Review of Economics and Statistics*, 1–48.

Antràs, P., Fadeev, E., Fort, T. C., and Tintelnot, F. (2024b). Export-Platform FDI: Cannibalization or Complementarity? In *AEA Papers and Proceedings*, Vol. 114, pp. 130–135. American Economic Association.

Antras, P., and Helpman, E. (2004). Global sourcing. In *Journal of political Economy*, 112(3), 552-580.

Ariu, A., and Ogliari, L. (2023). Services' trade in Africa: Structure and growth. In *The World Economy*, 46(11), 3345-3366.

Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., and Wager, S. (2021). Synthetic difference-in-differences. In *American Economic Review*, 111(12), 4088-4118.

Baldwin, R., and Okubo, T. (2014). Networked FDI: Sales and sourcing patterns of Japanese foreign affiliates. *The World Economy*, 37(8), 1051-1080.

Baldwin, R. E., and Venables, A. J. (1995). Regional Economic Integration. In *Handbook of International Economics*, Vol. 3, pp. 1597–1644.

Bartlett, K. (2022). Japan Reengaging With Africa in Face of Rising China. *EAST ASIA Blog*.

Baker, A., Callaway, B., Cunningham, S., Goodman-Bacon, A., and Sant'Anna, P. H. (2025). Difference-in-Differences Designs: A Practitioner's Guide. In *Journal of Economic Literature*.

Biyik, O. (2022). Japanese Automobile Industry in the AfJEPA: Economic Impacts of Deep Integration Policy. *Journal of the Graduate School of Asia-Pacific Studies*, 43:17-33.

Blonigen, B. A. (2001). In Search of Substitution Between Foreign Production and Exports. *Journal of International Economics*, 53(1), 81–104.

Brada, J. C., Drabek, Z., and Iwasaki, I. (2021). Does investor protection increase foreign direct investment? A meta-analysis. *Journal of Economic Surveys*, 35(1), 34–70.

Bruno, R. L., Cipollina, M., and Dal Bianco, S. (2023). The Ripple Effect of Sanctions: Exploring the Impact on Global Value Chains Using a Gravity Model. *Italian Economic Journal*, 9(3), 1063–1087.

Borusyak, K., Jaravel, X., and Spiess, J. (2024). Revisiting event-study designs: robust and efficient estimation. *Review of Economic Studies*, 91(6), 3253-3285.

Carballo, J., de Artiñano, I. M., Ottaviano, G. I., and Martincus, C. V. (2021). Linkages with multinationals: the effects on domestic firms' exports. *mimeo, IADB*.

Callaway, B., and Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of econometrics*, 225(2), 200-230.

Conconi, P., Leone, F., Magerman, G., and Thomas, C. (2024). Multinational networks and trade

participation (No. 456). *NBB Working Paper*.

Coulibaly, S., Kassa, W., & Zeufack, A. G. (2022). Africa in the new trade environment: Market access in troubled times *World Bank Publications*.

Daimon-Sato, T. (2020). Japan and China in Competition or Cooperation? Perspectives for Africa. *Doctoral dissertation, Waseda University*.

Dollar, D. (2016). China's Engagement with Africa: From Natural Resources to Human Resources. *Brookings Institution Report*.

De Chaisemartin, C., and d'Haultfoeuille, X. (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American economic review*, 110(9), 2964-2996.

Egger, P., Larch, M., Staub, K., and Winkelmann, R. (2008). The impact of bilateral investment treaties on FDI dynamics. *Canadian Journal of Economics*, 41(3):777–804.

Egger, P., and Merlo, V. (2012). BITs bite: An anatomy of the impact of bilateral investment treaties on multinational firms. *The Scandinavian Journal of Economics*, 114(4), 1240-1266.

Egger, P., Pirotte, A., and Titi, C. (2023). International investment agreements and foreign direct investment: A survey. *The World Economy*, 46(6), 1524-1565.

French, S. (2017). Revealed comparative advantage: What is it good for? *Journal of International Economics*, 106, 83-103.

Gelpern, A., Horn, S., Morris, S., Parks, B., and Trebesch, C. (2023). How China lends: A rare look into 100 debt contracts with foreign governments. *Economic Policy*, 38(114), 345-416.

Grossman, G. M., and Rossi-Hansberg, E. (2008). Trading Tasks: A Simple Theory of Offshoring. *American Economic Review*, 98(5), 1978–1997.

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of econometrics*, 225(2), 254-277.

Harding, T., and Javorcik, B. S. (2012). Foreign Direct Investment and Export Upgrading. *Review of Economics and Statistics*, 94(4), 964–980.

Hansen, B. E. (2025). Standard Errors for Difference-in-Difference Regression. *Journal of Applied Econometrics*.

Heid, B., and Vozzo, I. (2020). The international trade effects of bilateral investment treaties. *Economics Letters*, 196, 109569.

Hirono, M. (2019). Asymmetrical rivalry between China and Japan in Africa: to what extent has Sino-Japan rivalry become a global phenomenon? *The Pacific Review*, 32(5), 831-862.

Jaax, A., Miroudot, S., and van Lieshout, E. (2023). Deglobalisation? The Reorganisation of Global Value Chains in a Changing World.

JETRO (2018). Afurika shinshutsu Nikkei kigyo jittai chosa (2017 nendo chosa) (Survey of the situations of Japanese companies in Africa (survey in 2017 financial year)). Survey.

Jones, L., and Bethmann, E. (2023). Approaches of Measuring Revealed Comparative Advantage (RCA): Literature Review. *US International Trade Commission*.

Keiichi, S. (2024). Japan's Strategic Interests in the Global South: Africa. *CSIS Blog*. .

Ketchley, N., Andersen, M. S., and Sending, O. J. (2025). The Chinese are coming! US think tanks and the Belt and Road Initiative in the Middle East and North Africa. *Review of International Political Economy*, 1-31.

Li, S., Urata, S., and Zhao, L. (2024). Does the quality of bilateral investment treaties matter for outward foreign direct investment? *International Review of Economics & Finance*.

MacKinnon, J. G., Nielsen, M. Ø., and Webb, M. D. (2023). Leverage, Influence, and the Jackknife in Clustered Regression Models: Reliable Inference Using summclust. *The Stata Journal*, 23(4), 942–982.

Mancini, M., Montalbano, P., Nenci, S., and Vurchio, D. (2024). Positioning in Global Value Chains: World Map and Indicators, a New Dataset Available for GVC Analyses. *The World Bank Economic Review*.

Ministry of Economy, Trade and Industry (METI). (2019). Investment (Chapter 5), in Japan's WTO Policy Report 2019. METI, Tokyo. Technical report. meti.go.jp/english/report/data/2019WTO/pdf/03˙05˙01.pdf

Mensah, C. (2015). China and Japan in Africa: globalization and new norms of development assistance and cooperation. *BJIR*.

Nagengast, A. J., and Yotov, Y. V. (2025). Staggered Difference-in-Differences in Gravity Settings: Revisiting the Effects of Trade Agreements. *American Economic Journal: Applied Economics*, 17(1), 271–296.

Nkala, S. (2021). Africa and the Indo-Pacific Dynamics: China, India, and Japan's Strategic Competition in Africa's Indian Ocean States. *Journal of African Foreign Affairs*, 8(3).

Onyango, W., Majune, S., and Naluwooza, P. (2025). Chinese import dominance and structural transformation in Africa. *Oxford Development Studies*, 1-17.

Ornelas, E., Turner, J. L., and Bickwit, G. (2021). Preferential trade agreements and global sourcing. *Journal of International Economics*, 128, 103395.

Sun, L., and Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of econometrics*, 225(2), 175-199.

van Staden, C. (2020). Japan and China's summit competition in Africa. *South African Institute of International Affairs, Policy Insights series*, 78.

Urata, S. and Baek, Y. (2023). Impact of international investment agreements on Japanese FDI: A firm-level analysis. *The World Economy*, 46(8):2306–2334.

Xiong, T., and Sun, H. (2023). The international service trade effects of bilateral investment treaties. *The World Economy*, 46(8), 2538-2555.

Wooldridge, J. M. (2023). Simple approaches to nonlinear difference-in-differences with panel data. *The Econometrics Journal*, 26(3), C31-C66.

Appendix A Tables and Figures

Table A1: Outward FDI and Trade of Japan and China with Africa (US$ Million)

Year	Japanese FDI Stocks into Africa			Chinese FDI Stocks into Africa		
	Value ($)	Japan (%)	Africa (%)	Value ($)	China (%)	Africa (%)
2010	3,678	0.44%	1.16%	13,042	4.11%	2.10%
2011	4,142	0.43%	0.98%	16,244	3.82%	2.50%
2012	4,258	0.41%	0.80%	21,730	4.08%	3.05%
2013	3,721	0.33%	0.56%	26,186	3.96%	3.46%
2014	5,231	0.45%	0.59%	32,350	3.67%	4.12%
2015	6,663	0.54%	0.61%	34,694	3.16%	4.30%
2016	6,112	0.46%	0.45%	39,877	2.94%	4.99%
2017	7,829	0.52%	0.43%	43,296	2.39%	5.03%
2018	9,533	0.61%	0.48%	46,104	2.33%	5.28%
2019	8,291	0.47%	0.38%	44,390	2.02%	4.80%
2020	3,746	0.20%	0.15%	43,399	1.68%	4.55%
2021	5,309	0.27%	0.19%	44,186	1.59%	4.31%
2022	6,895	0.35%	0.25%	40,901	1.48%	3.91%
2023	9,373	0.44%	0.32%	-	-	-
Year	**Japan's Exports to Africa**			**China's Exports to Africa**		
	Value ($)	Japan (%)	Africa Import (%)	Value ($)	China (%)	Africa Import (%)
2010	16,792	1.56%	3.66%	57,272	3.79%	12.48%
2011	19,000	1.60%	3.56%	65,340	3.84%	12.25%
2012	17,180	1.61%	3.16%	70,028	4.16%	12.89%
2013	15,508	1.59%	2.77%	76,592	4.19%	13.67%
2014	15,053	1.51%	2.56%	84,634	4.52%	14.39%
2015	13,188	1.37%	2.47%	84,604	4.76%	15.82%
2016	12,176	1.19%	2.45%	78,903	4.41%	15.85%
2017	10,637	1.07%	2.11%	78,702	4.18%	15.62%
2018	10,817	1.10%	1.90%	89,331	4.21%	15.66%
2019	10,651	1.27%	1.91%	95,646	4.52%	17.11%
2020	8,769	1.23%	1.78%	98,704	4.40%	20.09%
2021	10,111	1.27%	1.63%	108,175	4.40%	17.44%
2022	10,180	1.29%	1.38%	125,210	4.57%	16.99%
2023	10,458	1.38%	1.46%	128,269	5.12%	17.94%

Notes: This table presents outward FDI stocks and trade volumes of Japan and China with Africa from 2010 to 2023. The values represent millions of U.S. dollars. Percentages indicate the share of each country's total outward FDI or exports. Missing data for 2023 in Chinese FDI stocks are denoted with "-". **Source:** Author's preparation.

Figure A1: Details of the Japanese BITs with Countries in Africa

Feature	Japan-Mozambique		Japan-Kenya		Japan-Côte d'Ivoire		Japan-Morocco		Japan-Angola	
Sign/Force	06/2013	**07/2014**	08/2016	**09/2017**	01/2020	**03/2021**	01/2020	**04/2022**	08/2023	**07/2024**
Restricted Sectors by Japan	Agriculture, Fisheries & Energy; Financial Sector; Mining & Natural Resources; Telecommunications & Media; Transport & Logistics		Land & Real Estate; Public Services; Defense & Arms Industry; Telecommunications & Broadcasting		Energy & Utilities; Telecommunications & Media; Fisheries & Agriculture; Aerospace & Arms Industry		Natural Resources & Energy; Financial Services; Public Morals & Anti-Corruption		Telecommunications & Broadcasting; Land & Real Estate; Public Infrastructure & Social Services; Transport & Logistics	
Restricted Sectors by Host Country	Natural Resources; Financial Services; Public Services		Natural Resources; Financial Services; Public Services; Land Ownership; Agriculture & Maritime Activities		Land; Agriculture & Fisheries; Information & Communication Technologies; Cultural Goods; Food Products		Natural Resources & Extractives; Financial Services; Agriculture & Maritime Activities		Oil & Gas; Defense & Arms Industry; Water Distribution; Infrastructure & Utilities; Real Estate	
Host Country Control	Environmental & labor regulations on investment projects		Stronger labor & environmental regulation in industrial and mining sectors		Public policy measures in land, finance, and infrastructure		Stricter control over strategic industries such as finance & energy		Local content rules in oil & gas industry	
Japan's Protections	Investor protections & Free transfer of funds		Investor protections & Free transfer of funds		Investor protections & Free transfer of funds		Investor protections & Free transfer of funds		Investor protections & Free transfer of funds	
Dispute Resolution	ICSID/UNCITRAL-based arbitration		ICSID/UNCITRAL-based arbitration		ICSID/UNCITRAL-based arbitration		ICSID/UNCITRAL-based arbitration		ICSID/UNCITRAL-based arbitration	
Power Dynamics	Moderate asymmetry, focusing on sustainable development		Significant asymmetry in Japan's favor		Less asymmetry: Côte d'Ivoire imposes relatively balanced controls		Moderate asymmetry, with Morocco asserting more control		More asymmetry due to Angola's dependence on Japan's FDI in oil and gas	

Note: Briefly, Japan has signed BITs with seven African countries: Egypt(1977/1978), Mozambique (2013/2014), Kenya (2016/2017), Côte d'Ivoire (2020/2021), Morocco (2020/2022), Angola (2023/2024), and Zambia (2025). Information can be viewed at MOFA. This agreement framework heavily focuses on protecting Japanese investors (Articles on Expropriation and Compensation in all agreements), guaranteeing investors safeguards against expropriation without prompt and adequate compensation and allow the free transfer of funds, such as profits and dividends, across borders without restrictions. They mandate the use of international arbitration mechanisms, such as ICSID or UNCITRAL, for resolving disputes, thereby reducing the reliance on host countries' domestic legal systems. Restricted sectors are outlined in Articles 2-27 and detailed in the Annexes, with specific industries identified by HS two-digit codes: 1-3, 6-8, 12, 16, 19, 20-21, 27, 30, 35, 41-43, 49, 61-62, 64, 72-73, 88-89, 93, and 95. However, a key limitation is that some annexes were not fully provided. For instance, in the Japan-Mozambique BIT, Annex I for Japan is provided, but Annex II for Mozambique is missing. Similarly, I could not locate complete annexes for both parties in the Japan-Kenya and Japan-Morocco agreements. However, I was able to find the full-text BITs for Japan-Angola and Japan-Côte d'Ivoire. Based on recurring patterns in Japan's other BITs, it is reasonable to infer that Both Japan and BIT members' reserved sectors likely include banking and finance, utilities, information and communications, land ownership and leasing, natural resources, and security services, consistent with broader Japanese investment policy practices (METI 2019). **Source:** Author's analysis of the Ministry of Foreign Affairs of Japan (MOFA) and UNCTAD treaty texts.

Table A2: Japanese FDI Flows into African BIT Members (2010–2024, 100 million JPY)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Egypt	-41	-39	-47	-44	61	57	-31	129	4	34	11	24	19	35	32
Mozambique	0	11	-4	-28	14	-7	0	-2	0	0	n.a	n.a	n.a	n.a	n.a
Kenya	n.a	-1	-2	-10	-2	8	3	114	9	12	9	9	7	13	15
Côte d'Ivoire	n.a	-5	n.a	n.a	n.a	4	5	n.a	6	-4	-1	0	n.a	0	n.a
Morocco	-12	-4	1	-7	-1	11	11	8	13	22	-2	-7	13	84	1
Angola	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Zambia	n.a	n.a	n.a	n.a	n.a	0	3	-1	1	3	4	4	3	3	1

Notes: Figures are compiled using the Directional Principle under two international accounting standards. Data for 2010–2013 are sourced from the BOJ BPM5 portal, while post-2014 figures follow BPM6 methodology available at the BOJ BPM6 database. This approach measures net flows from the investor's perspective and deducts reverse investments (e.g., loans or equity repatriation from affiliates), which can result in negative values. Net FDI values may be negative, indicating that capital outflows exceeded inflows in that year. While this data provides a comprehensive picture of Japanese FDI, it also reveals limited or absent flows to certain BIT partners, such as Angola, the pattern consistent with the findings of Brada et al., (2021). **Source:** Bank of Japan.

Table A3: Summary Statistics of Variables

Variable	Panel Dataset A: HS-1 Aggregated Level					Panel Dataset B: HS-2 Sectoral Level				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
	Dependent Variables					**Dependent Variables**				
JpExp.	9,365	15.122	44.962	0	596.321	392,214	3.541	53.377	0	5,898.134
JpImp.	9,365	192.042	837.318	0	12,257.71	392,214	4.514	91.866	0	10,164.45
	Independent Variables					**Independent Variables**				
JBIT_F	9,365	0.0472	0.2121	0	1	392,214	0.0852	0.2792	0	1
JBIT_S	9,365	0.0556	0.2292	0	1	392,214	0.0962	0.2949	0	1
ChBIT_F	9,365	0.3584	0.4795	0	1	392,214	0.4651	0.4988	0	1
ChBIT_S	9,365	0.6091	0.4880	0	1	392,214	0.6851	0.4645	0	1
	Control Variables					**Control Variables**				
ChExp.	9,365	48.993	208.941	0	2,807.75	392,214	21.932	143.805	0	9,915.933
ChImp.	9,365	87.573	247.265	0	2,185.194	392,214	11.688	298.008	0	27,965.35

Note: This table presents the descriptive statistics for each variable in the empirical model. *JpExp.* and *JpImp.* represent Japan's exports to and imports from African countries, respectively, while *ChExp.* and *ChImp.* represent China's exports to and imports from African countries. Trade values were adjusted by dividing by 1,000,000 (HS-1) and 100,000 (HS-2). *JBIT_F* and *JBIT_S* denote enforced and signed Japanese Bilateral Investment Treaties, respectively; *ChBIT_F* and *ChBIT_S* capture the same for China. **Source:** Authors' calculation.

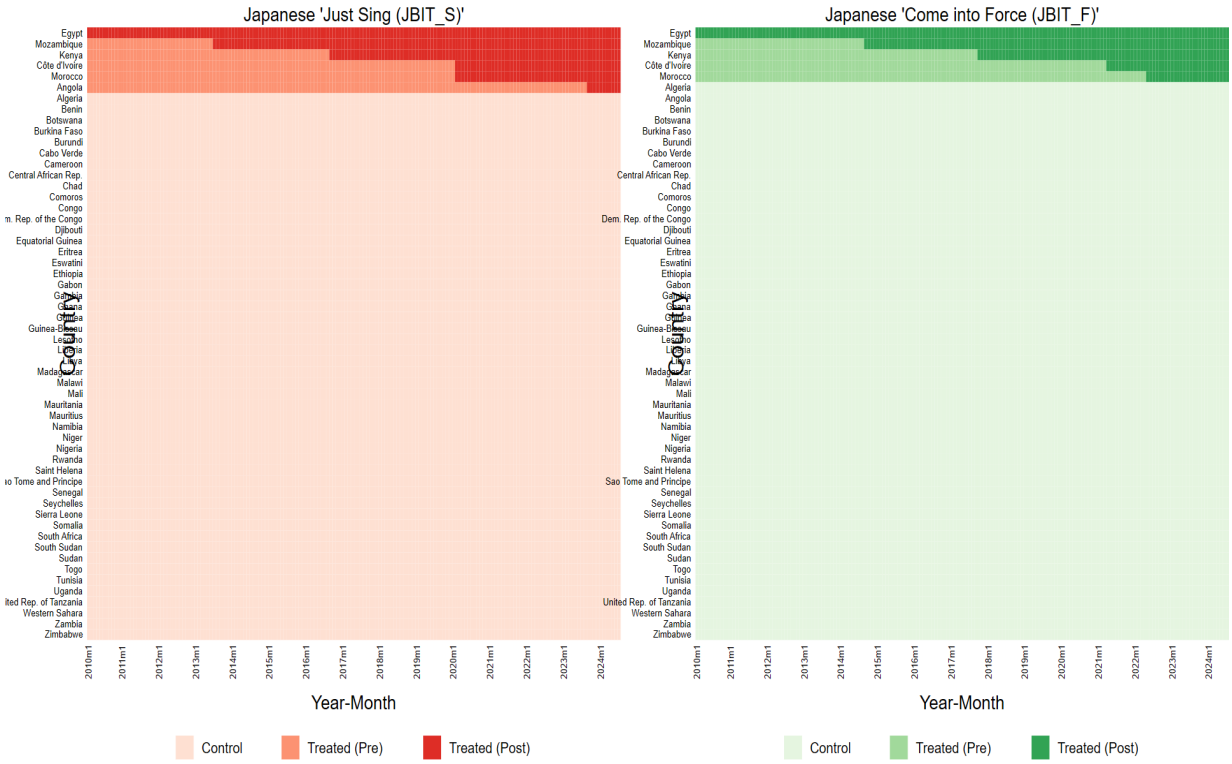
Table A4: Summary Statistics by Treatment Status in Staggered DiD Design

Variable	Treatment Status			
	Never-treated (N=8,495)	Not-yet-treated (N=428)	Treated (first period) (N=5)	Already-treated (N=437)
A. Trade Flows (mean)				
Japan Export to Africa	12.57	24.40	36.86	55.47
Japan Import from Africa	19.68	9.94	6.55	19.10
China Export to Africa	51.59	10.15	22.64	36.90
China Import from Africa	69.57	110.92	272.54	412.51
B. Cohort Analysis (mean of treated groups)				
Cohort: Egypt		93.35		
Cohort: Mozambique (201408)		11.30		
Cohort: Kenya (201709)		69.30		
Cohort: Côte d'Ivoire (202103)		4.99		
Cohort: Morocco (202204)		21.45		

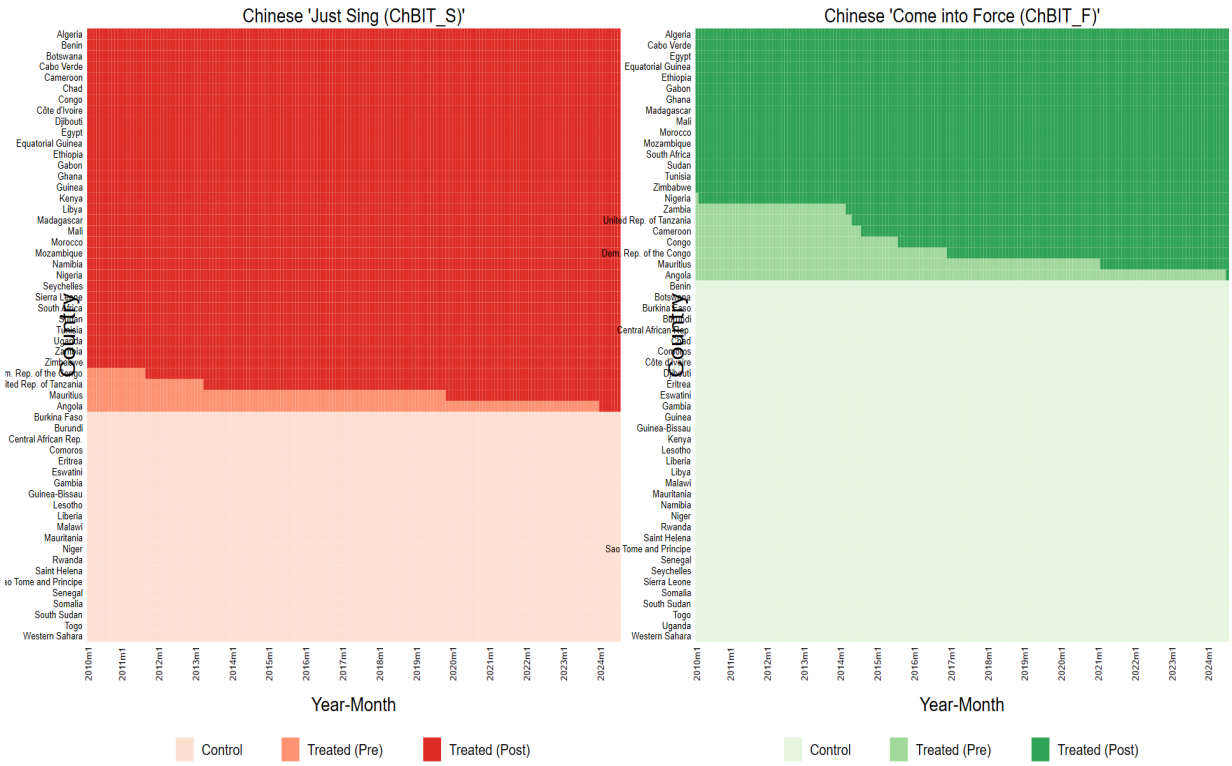
Note: This table presents simple summary statistics considering $JBIT_F$ in HS-1 aggregated level. Panel A shows mean values by staggered DiD treatment status. Panel B displays mean Japanese export values for each treatment cohort (year indicates BIT force date). Standard deviations available upon request. The sample includes 9,365 observations from 2010-2024.

Figure A2: Export of Cohorts and Treatment Status Over Period

(a) Japanese BIT with Africa as JBIT



(b) Chinese BIT with Africa as ChBIT



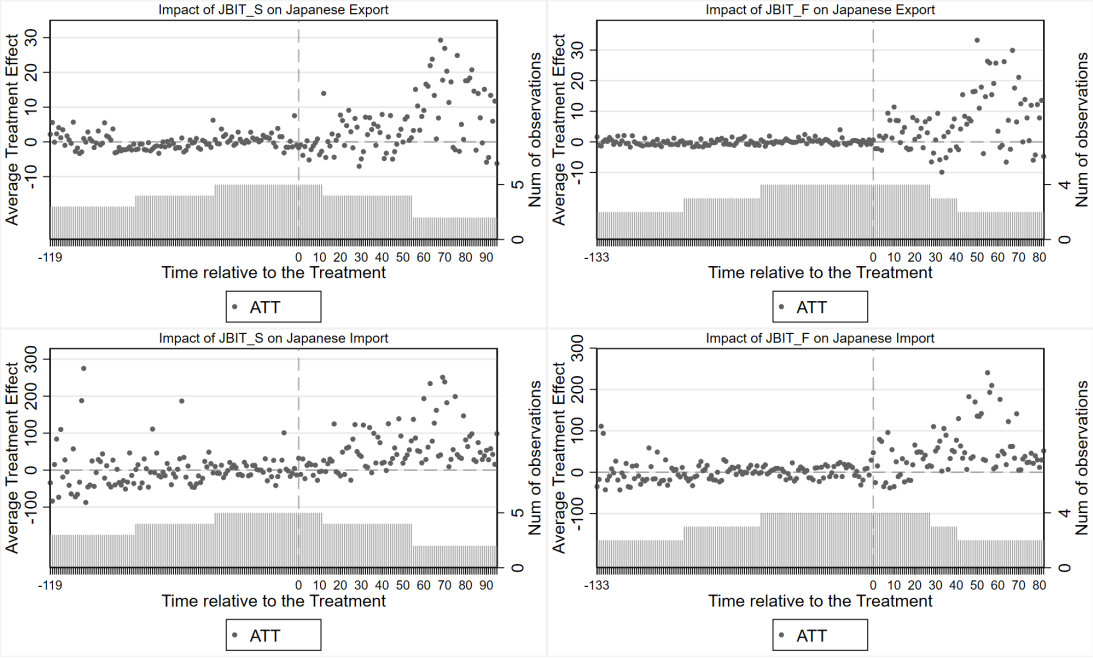
Note: We plot datasets of the Japanese and Chinese exports with Africa regarding Control, Pre-Treatment, and Post-Treatment. We distinguish between those that are merely *Signed* and those that are *Enforced* .**Source:** Author's preparation

Table A5: Sector-Specific Estimates Excluding Investment-Restricted Industries

Dependent Variable	**Japanese Export Value (Restricted Sectors)**							
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	BIT Enforced (JBIT_F)				**BIT Signed Only (JBIT_S)**			
JBIT	1.173***	0.225***	1.349***	0.231***	0.982***	0.217***	1.349***	0.231***
	(0.221)	(0.0417)	(0.241)	(0.0394)	(0.212)	(0.0393)	(0.241)	(0.0394)
ChExp	-0.00659***	-7.29e-06	-0.00518***	2.33e-06	-0.00660***	-9.40e-06	-0.00518***	2.33e-06
	(0.00158)	(2.29e-05)	(0.00175)	(2.32e-05)	(0.00158)	(2.28e-05)	(0.00175)	(2.32e-05)
JBIT#ChExp			-0.00917***	-8.60e-05*			-0.00917***	-8.60e-05*
			(0.00345)	(5.04e-05)			(0.00345)	(5.04e-05)
Observations	392,069	256,385	392,069	256,385	392,069	256,385	392,069	256,385
Pseudo/R^2	0.733	0.911	0.733	0.911	0.733	0.911	0.733	0.911
Dependent Variable	**Japanese Import Value (Restricted Sectors)**							
JBIT	1.146***	0.437***	1.094***	0.437***	1.179***	0.494***	1.130***	0.494***
	(0.222)	(0.111)	(0.252)	(0.111)	(0.221)	(0.0890)	(0.248)	(0.0890)
ChImp	-0.0162***	-7.15e-05***	-0.0163***	-7.15e-05***	-0.0162***	-7.14e-05***	-0.0163***	-7.13e-05***
	(0.00502)	(1.84e-05)	(0.00504)	(1.85e-05)	(0.00502)	(1.84e-05)	(0.00504)	(1.85e-05)
JBIT#ChImp			0.0213	-1.13e-05			0.0212	-1.02e-05
			(0.0462)	(0.000175)			(0.0459)	(0.000175)
Observations	392,069	175,679	392,069	175,679	392,069	175,679	392,069	175,679
Pseudo/R^2	0.667	0.919	0.667	0.919	0.667	0.919	0.667	0.919
Panel B	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2
FE (δ_{ip}, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This analysis evaluates the impact of BIT policies on Japan's trade with African countries across sectors having no bilateral investment restrictions. The investment restricted sectors are defined by HS two-digit codes: 1–3, 6–8, 12, 16, 19, 20–21, 27, 30, 35, 41–43, 49, 61–62, 64, 72–73, 88–89, 93, and 95 (see Figure A1). Columns (1–4) correspond to BITs that have entered into force, while Columns (5–8) relate to signed BITs not yet enforced. Interaction terms (JBIT#ChExp / JBIT#ChImp) capture trade diversion effects towards China. All models include bilateral (country-industry as δ_{ip}) and time (year-month as δ_{tm}) fixed effects. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors in parentheses. **Source:** Author's calculation.

Figure A3: Estimated Average Treatment Effects of JBIT on Japanese Trade with Africa



Note: Japan's BITs distinguishes between those that are merely *Signed* ($JBIT_S$) and those that are *Enforced* ($JBIT_F$).
Source: Author's preparation.

Table A6: Industry-Restricted Results of BIT Enforced with Imputation Method

Dependent Variable	**Japanese Export**				**Japanese Import**			
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	Bootstrap		**Jackknife**		**Bootstrap**		**Jackknife**	
JBIT_F	1.173***	0.225***	1.173*	0.225	1.146***	0.437***	1.146	0.437
	(0.238)	(0.0383)	(0.672)	(0.1386)	(0.2344)	(0.1213)	(0.9944)	(0.3652)
	Estimation of Country Result							
Egypt	–	–	–		–	–	–	
Mozambique	1.214***	0.200**	1.214*		2.041***	0.739***	2.041**	
	(0.204)	(0.0978)	(0.704)		(0.2421)	(0.2580)	(0.9763)	
Kenya	1.471***	0.242***	1.471**		0.664***	0.365***	0.664	
	(0.478)	(0.0517)	(0.658)		(0.2233)	(0.0818)	(0.8745)	
Côte d'Ivoire	1.546***	0.614***	1.546***		-0.418	0.0184	-0.418	
	(0.3296)	(0.0865)	(0.500)		(0.320)	(0.1390)	(1.4430)	
Morocco	0.578*	0.0467	0.578		1.081**	0.472**	1.081	
	(0.329)	(0.0690)	(0.827)		(0.4958)	(0.2147)	(0.6912)	
Exogenous Variables								
ChExp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel A	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2	HS-2
FE $(\delta_{ip}, \delta_{tm})$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bootstrap	Yes	Yes	No	No	Yes	Yes	No	No
Jackknife	No	No	Yes	Yes	No	No	Yes	Yes
Observations	392,069	256,385	392,069	256,385	392,069	256,385	392,069	256,385

Note: This table examines the impact of BIT policy on Japanese trade dynamics regarding industry-restricted regulation policy using both linear and nonlinear models to address heteroskedasticity and potential downward bias. The dataset spans from January 2010 to June 2024. Columns (1–2) present OLS and PPML estimates with bootstrap clustering at the partner level (MacKinnon et al., 2023), as the baseline specification consistent with Table 2. Columns (3–4) apply jackknife clustering, improving variance estimation per Hansen (2024). Columns (5-8) replicate the framework for Japanese imports to assess differential effects. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are reported in parentheses. **Source:** Author's calculation.

Appendix B External Analysis and Framework of the Model

Appendix B.1 Heterogeneous DiD Strategy for BITs

Understanding the Mechanisms of BIT Policy

In this appendix, we dive into the mechanisms through which BITs influence trade patterns. Briefly, we adopt a staggered DiD strategy to address the limitations of the traditional TWFE model as outlined in Equation (3.2). This is because the empirical identification of BIT effects faces two linked challenges: (i) BITs are implemented at different dates across partner countries (staggered adoption), and (ii) treatment effects may vary across cohorts, sectors and over time. To address these issues we adopt a heterogeneity-robust DiD method that explicitly models cohort- and event-time heterogeneity and that is suitable for multiplicative trade outcomes.[31]

Our primary causal object is the average (cohort-specific) effect of enforced BITs on bilateral trade flows in the post-treatment horizon. Identification relies on three standard assumptions in the potential-outcomes framework: (i) *no anticipation* (units do not change outcomes in expectation because of a future enforcement date, beyond what is captured by observed covariates), (ii) *no external spillovers* from treated units to control units (SUTVA), and (iii) *parallel trends* in untreated potential outcomes: $E[Y_{it}(0)] = \alpha_i + \beta_t$ (or a properly conditioned version). We discuss practical diagnostics and relaxations below because some of these assumptions are substantive and partially untestable.

By concentrating on African countries, which share comparable institutional and developmental characteristics and maintain distinct trade relationships with Japan, we aim to mitigate biases that might arise from preexisting trade agreements, such as those involving the USA, EU, and ASEAN. This focus enhances the precision of our analysis regarding the effects of BITs on trade patterns within the African context (parallel trend conditioning). Figure A2 illustrates the timeline of each country's participation in BIT agreements.[32]

Estimation Strategy of the (Staggered) DiD Model

Our empirical design aligns with recent methodological contributions (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021). We follow the extended TWFE (ETWFE) estimator as formulated in Wooldridge (2023) and applied by Nagengast and Yotov (2025):

$$JpTra_{iptm} = \exp\Bigg(\sum_{g=q}^{T} \sum_{s=g}^{T} \beta_{1,gs}^{ETWFE} JBIT_{iptm}^{gs} + \beta_2 ChBIT_{iptm} + \beta_3 ChTra_{iptm} + \beta_4 X_{iptm} + \delta_{ip} + \delta_{tm} \Bigg) \cdot \varepsilon_{iptm}, \tag{B1.1}$$

here, g indicates the treatment cohort of the country-product pair (ip) at period tm, and q denotes the first year of treatment for each cohort, while T is the final year, 2024. For instance, the BIT indicator takes the value of 201408 for cohort g in the post-treatment period $(s = t)$ starting August 2014, and zero otherwise. Crucially, the ETWFE method excludes already-treated units from serving

[31] Why staggered DiD? BIT rollouts are a canonical staggered-adoption setting: different Japan–Africa BITs are signed and (later) enter into force at distinct dates. A conventional TWFE regression, which pools all treated observations into a single average, can be biased when treatment effects are heterogeneous across cohorts or evolve over time (Goodman-Bacon, 2021; de Chaisemartin and D'Haultfoeuille, 2020). In particular, TWFE estimators may place negative weights on some cohort×time contrasts (so-called "forbidden comparisons"), producing misleading summary estimates. For this reason, we treat staggered adoption as a suitable design and adopt estimators that recover cohort-specific causal effects (CATTs) and cleanly aggregate them into interpretable average treatment effects.

[32] Notably, Japanese BITs with key African nations include Kenya, Mozambique, Morocco, Côte d'Ivoire, and Angola. Egypt is also included to evaluate the cumulative impact of BIT policies on trade integration.

as controls for other treated observations, thereby correcting for biases noted by Goodman-Bacon (2021).[33] This ensures that the Average Treatment Effect on the Treated (ATET) is more accurately estimated, using only not-yet or never-treated observations as the comparison group.

The ETWFE model is estimated using OKS or PPML, which is particularly well-suited for trade data that exhibit a large number of zeros and inherent heteroskedasticity (Santos Silva and Tenreyro, 2006; 2011). PPML, combined with high-dimensional fixed effects, enables control for unobserved heterogeneity across country-product pairs and time dimensions. Additionally, we use robust or cluster standard errors appropriately to account for intra-group correlation and apply unit-period-specific weights to address variance differences due to trade intensity.

Empirical Result of Japanese Export

Before presenting the main estimation results, we examine the impact of Japan's BITs by distinguishing between those that are merely *Signed* and those that are *Enforced*. It is anticipated that only *Enforced* BITs should exhibit a positive effect post-treatment, with no significant effect during the pre-treatment period. Figure A3 illustrates this by focusing on the effects of Enforced BITs ($JBIT_F$). For the simplicity of the model and the logic of this article, this section examines the impact of $JBIT_F$ on Japanese exports to Africa employing the ETWFE model.

Test of Identifying Assumptions

It is advisable/essential to assess the key identifying assumptions underpinning the ETWFE estimator, namely, the *parallel trends* and *no-anticipation* assumptions.[34] To evaluate these assumptions, we adopt the approach proposed by Nagengast and Yotov (2025). Figure B1 displays the results of this pre-trend test. The coefficients on the placebo leads are generally small and statistically insignificant, suggesting the absence of systematic differences between treated and untreated groups prior to the enforcement of JBIT_F. With the exception of one outlier at $t = -3$, all pre-treatment estimates are close to zero.[35] Beyond that, to ensure robustness, we further exclude this conspicuous period and shifting the treatment window forward in a sensitivity analysis (see Table B3), a common strategy recommended in the literature (Wooldridge, 2023; Baker et al., 2025).

Main Estimation Results

To assess the dynamic and heterogeneous effects of Japan's BITs on trade with African countries, we apply the ETWFE estimator, following Nagengast and Yotov (2025). Table B1 presents robust evidence that Japanese BITs significantly boost exports to African countries, particularly under specifications that control for treatment heterogeneity. Across aggregated HS-1 trade (Columns 1–3), the treatment effect of enforced BITs ($JBIT_F$) are positive and statistically significant in Columns 1 and 2. Sectoral-level analysis (HS-2, Columns 4–6) reinforces this finding, with JBIT_F coefficients remaining significant and economically meaningful, reinforcing the findings reported earlier in Tables 1 and 2. These results suggest that JBITs consistently enhance Japanese exports with African partner countries (Heid and Vozzo, 2020). Importantly, the variation in effect sizes

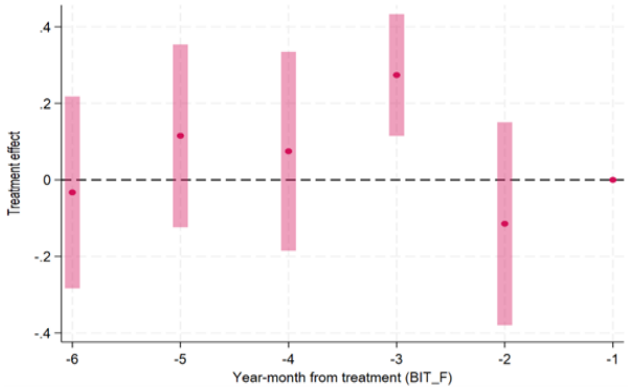
[33] We performed the Bacon decomposition (using the ddtiming and bacondecomp methods), and the results are available upon request.

[34] These conditions are to set stages to ensure that the staggered DiD framework yields valid causal estimates of the impact of BITs on trade outcomes (Callaway and Sant'Anna, 2021; Wooldridge, 2023) while the parallel trend condition is partially untestable.

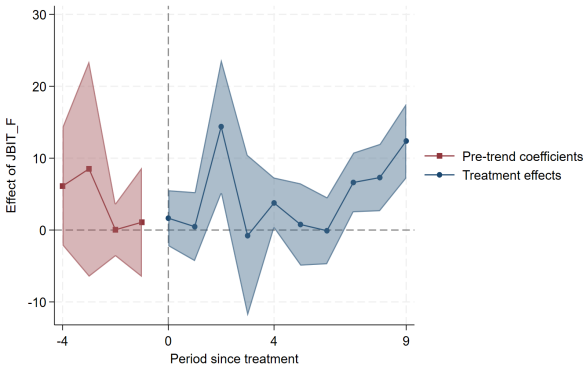
[35] We also run anticipation tests, showing 0 (zero, available upon request). Also, cohort-specific parallel trends results are available upon request, which is consistent with Figure 1. These findings provide reassuring evidence that the identifying assumptions of the ETWFE framework are not violated in our context. Thus, we proceed to estimate the causal effect of enforced Japanese BITs on trade dynamics in Africa using the heterogeneity-robust staggered DiD estimator within a trade model structure.

Figure B1: Pre-Treatment Effects of BIT Enforced, $JBIT_F$

(a) Nagengast and Yotov (2025)



(b) Borusyak, Jaravel, and Spiess (2024)



Note: Figure B1a reports the pre-trend effects following Nagengast and Yotov (2025), and Figure B1b reports those following Borusyak, Jaravel, and Spiess (2024). The full set of dynamic ATTs by horizon (i.e., number of periods since treatment) through dCDH ($did_multiplegt_dyn$), anticipation tests (zero), and cohort-specific parallel trends results are available upon request. *Source:* Author's calculation.

across specifications reflects the importance of accounting for unit- and time-specific heterogeneity in staggered policy environments.

Table B1: Results of ETWFE Estimation on Japanese Exports to Africa

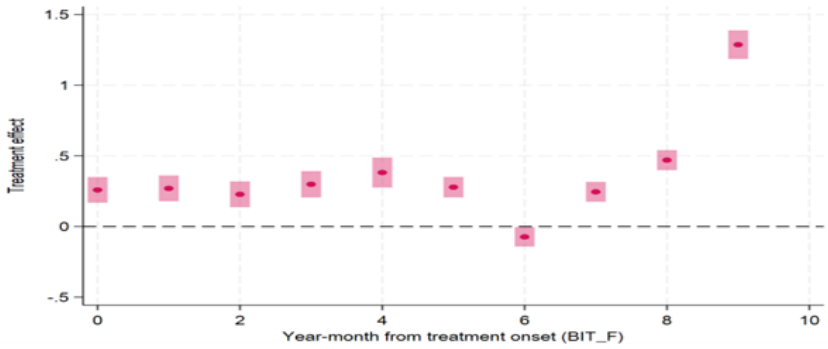
Estimator	(1) ETWFE	(2) ETWFE	(3) ETWFE	(4) ETWFE	(5) ETWFE	(6) ETWFE
	Panel A (HS-1) Sample			**Panel B (HS-2) Sample**		
JBIT_F (ATET)	0.163**	0.229***	0.0962	0.139**	0.215***	0.240***
	(0.0678)	(0.0746)	(0.0642)	(0.0633)	(0.0680)	(0.0413)
Heterogeneity						
Unit Heterogeneity	Cohort	Cohort		Cohort	Cohort	
Time Heterogeneity	Period		Period	Period		Period
Exogenous Variables						
ChBIT_F	Yes	Yes	Yes	Yes	Yes	Yes
ChExp	Yes	Yes	Yes	Yes	Yes	Yes
Panel A & B	HS-1	HS-1	HS-1	HS-2	HS-2	HS-2
FE (δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes
FE (δ_i)	Yes	Yes	Yes	No	No	No
FE (δ_{ip})	No	No	No	Yes	Yes	Yes
Observations	9,365	9,365	9,365	375,565	375,771	375,771

Notes: ***,**,* represent significance at 1%,5% and 10% level respectively. Robust standard errors are reported in parentheses. This table examines the impact of BIT policy on Japanese exports to Africa using nonlinear modeling approaches to address heteroskedasticity and potential downward bias. Notably, we extend the simple framework by employing Heterogeneity effect of JWDID, explicitly capturing treatment heterogeneity, as recommended by Nagengast and Yotov (2025). The dataset spans from January 2010 to June 2024. Columns (1-3) present results of aggregated HS-1 export volume, while Columns (4-6) present results of sectoral HS-2 export volume. Columns (1&4) present baseline results. with regard to the degree of heterogeneity of the ETWFE estimator, Columns (2& 5) present the result regarding cohort unit heterogeneity while Columns (3&6) present the result regarding time heterogeneity. **Source:** Autor's calculation.

Event-Study Estimations

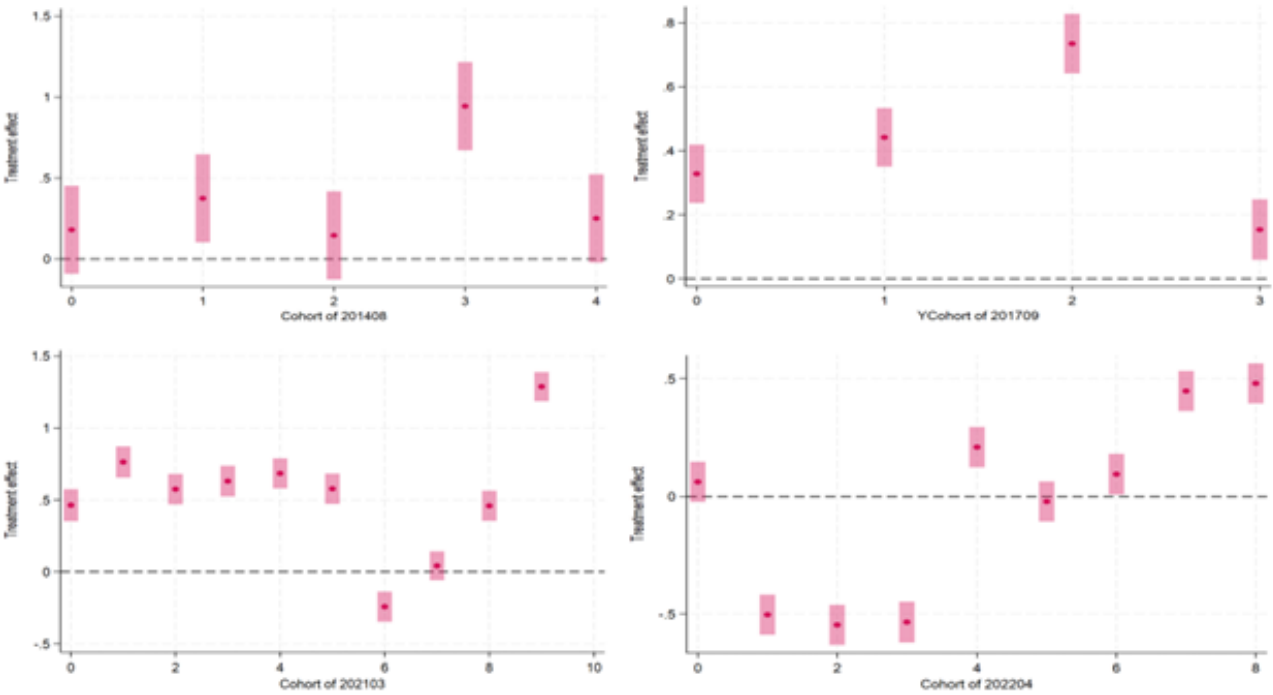
Figure B2 illustrates the evolution of the treatment effects of $JBIT_F$ on Japanese exports over time. The results indicate a clear post-treatment increase, particularly from Year +0 and Year +6, where effects are positive and statistically significant. These dynamic responses suggest that Japanese firms may gradually adjust their strategies, ramping up exports as confidence in legal protections afforded by $JBIT_F$ grows over time. This is consistent with expectations in staggered policy environments, where the full benefits of legal and institutional changes manifest gradually (Callaway and Sant'Anna, 2021; Wooldridge, 2023; Borusyak et al., 2024).

Figure B2: Event-Time BIT Policy of the Post-Treatment Effect for 10 Period, $JBIT_F$



Note:. **Source:** Author's preparation.

Figure B3: Event-Time BIT Policy Post-Treatment Effect by Cohort, $JBIT_F$



Note: The event-time plots present cohorts of Mozambique (as 201408), Kenya (as 201709), Côte d'Ivoire (as 202103), and Morocco (as 202204). **Source:** Author's preparation.

Further disaggregation by country reveals meaningful heterogeneity as presented in Table 3 where Kenya and Côte d'Ivoire display significant post-treatment gains. To examine country-level dynamics more closely, Figure B3 presents event-time plots for four specific cohorts: Mozambique (201408), Kenya (201709), Côte d'Ivoire (202103), and Morocco (202204). While Mozambique and Morocco show relatively muted responses, Kenya and Côte d'Ivoire exhibit strong and statistically

significant treatment effects that grow over time. This suggests that BITs can lead to meaningful trade gains, but only when conditions such as legal readiness, sectoral capacity, or existing trade relationships align to support deeper integration. These findings reinforce the importance of tailored investment strategies that account for the unique trajectories and institutional environments of partner countries, much like the FDI type presented in Kanya in Appendix B.5.

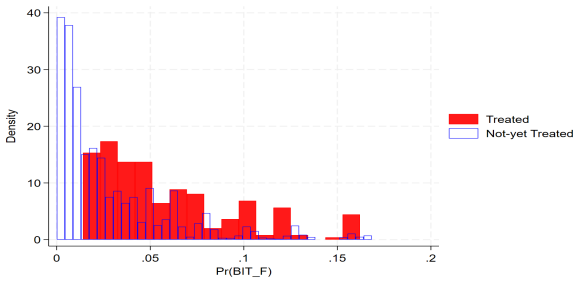
Robustness Analysis

Propensity Check (Covariate Balance)

We assess the credibility of the conditional parallel trends assumption by examining covariate balance. Figure B4 plots the distributions of propensity scores estimated from the probit models underlying our IPW estimators (detailed in Table B2). The substantial overlap between treated and control units supports the common support assumption necessary for inverse probability weighting.

Figure B4: Distribution of Propensity Scores, $JBIT_F$

(a) Probit Unweighted



(b) Probit Weighted

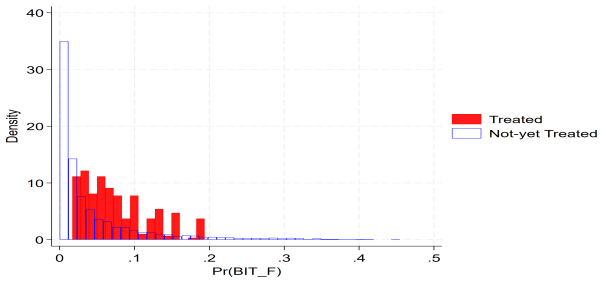


Table B2: DiD Estimates with Covariate Concern

Dependent Variable	**Japanese Export**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimator Method	reghdfe	ppmlhdfe	teffects Ipw (probit)	teffects ipwra(probit)	jwdid ppmlhdfe	csdid dripw	wooldid	did_imputation
BIT_F (ATET)	5.509***	0.278***	21.86***	21.56***	0.163**	3.688	5.574***	5.574*
	(1.168)	(0.0503)	(1.971)	(1.979)	(0.0708)	(6.8931)	(1.1248)	(2.2064)
Exclude Egypt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariate Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i θ_{tm})	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Observations	9,191	9,191	9,191	9,191	9,191	9,191	9,191	9,191

Notes: This table presents results from various estimators for the effect of BIT_F on Japanese exports to Africa. We exclude Egypt due to the bias of always-treated units from serving as controls for other treated observations. Column (1) uses reghdfe with two-way fixed effects; (2) uses Poisson Pseudo-Maximum Likelihood (ppmlhdfe); (3) and (4) apply inverse probability weighting (teffects); (5) implements the Wooldridge DiD estimator; (6) uses Callaway and Sant'Anna's csdid; (7) applies Wooldridge's panel DiD; (8) uses Borusyak et al.'s imputation estimator. All specifications exclude Egypt and control for Chinese BITs and Chinese exports to Africa. ***,**,* represent significance at 1%, 5% and 10% level respectively. Robust standard errors are reported in parentheses. **Source:** Author's calculation.

Table B2 reports robustness checks across multiple estimation approaches. Columns (3) and (4) implement inverse probability weighting (IPW) via `teffects`, using probit models to adjust for pre-treatment covariate differences. The strongly significant BIT coefficients (21.86 and 21.56,

$p < 0.01$) indicate that the positive treatment effect is robust to correction for selection on observables. The propensity score results align with conventional DiD estimators in columns (1), (2), (5), (7), and (8), which all show positive and significant BIT effects ranging from 0.163 to 5.574. Only the Callaway-Sant'Anna estimator (column 6) yields an insignificant coefficient, potentially due to its conservative treatment of staggered adoption.[36] Overall, the convergent evidence from propensity score and DiD methodologies supports the validity of our primary identification strategy, while the result from the staggered-robust estimator suggests a note of caution regarding effect heterogeneity.

Different DiD Assumptions

Table B3: Robustness with Respect to DiD-Specific Assumptions

Estimator	(1) JWDID	(2) JWDID	(3) JWDID	(4) JWDID	(5) JWDID	(6) JWDID	(7) JWDID	(8) JWDID
JBIT_F	0.255***	0.253***	0.163**	0.157**	0.0901	0.163**	0.341***	0.163
	(0.0917)	(0.0917)	(0.0678)	(0.0629)	(0.0702)	(0.0677)	(0.0473)	(0.1239)
				Estimation of Country Result				
Mozambique (201408)	0.2188	0.2179	0.0492	-0.0001	-0.0233	0.0492	0.319**	0.049
	(0.1955)	(0.1955)	(0.1399)	(0.1260)	(0.1408)	(0.1399)	(0.1400)	(0.0878)
Kenya (201709)	0.480***	0.378***	0.331***	0.337***	0.248***	0.331***	0.367***	0.331**
	(0.0549)	(0.0550)	(0.0511)	(0.0475)	(0.0565)	(0.0511)	(0.0509)	(0.1562)
Côte d'Ivoire (202103)	0.252***	0.247***	0.235***	0.239***	0.172***	0.235***	0.400***	0.235
	(0.0620)	(0.0621)	(0.0588)	(0.0569)	(0.0610)	(0.0588)	(0.0608)	(0.1787)
Morocco (202204)	0.0439	0.0380	0.0457	0.202***	-0.0068	0.0457	0.0822	0.046
	(0.0620)	(0.0622)	(0.0577)	(0.0573)	(0.0628)	(0.0577)	(0.0587)	(0.1526)
Sample/Treatment								
Omit Anticip. Period (BIT4)	Yes	Yes						
OAP (BIT5, Angola)		Yes						
Exclude Egypt			Yes					
Shift Treatment by 6 Months				Yes				
Covariate Interaction (China Export)					Yes			
Weights						Cohort	Export	
Exogenous Variables								
ChBIT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ChExp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i, δ_{tm}, δ_r)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jackknife	No	No	No	No	No	No	No	Yes
Observations	9,297	9,286	9,191	9,365	9,365	9,365	9,365	9,365

Notes: ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are reported in parentheses. The table presents nonlinear regression results considering heterogeneity effects heteroskedasticity issue. Column (1) omits the period between BIT_S (signed) and BIT_F (enforced) for BIT-4 countries to control for potential anticipation effects, following Wooldridge (2023). Similarly, Column (2) excludes the anticipation period for BIT-5 countries to refine treatment timing. Column (3) removes Egypt to mitigate distortions from long-term treatment effects exceeding 20 years, allowing for a more accurate dynamic evaluation. Column (4) shift BIT policy implication timing forward by 6 months as we experience sharp increase from t=6 (see Figure B2. Column (5) introduces an interaction term between Chinese trade with Africa and cohort-period effects. Columns (6) and (7) incorporate weighting based on cohort and export values to enhance estimation precision. Finally, jackknife (Column 8) and bootstrap (Column 8) clusters with JWDID are employed to improve standard error robustness, following Hansen (2024) and Nagengast and Yotov (2025).
Source: Autor's calculation.

The results in Table B3 demonstrate the stability of Japanese BIT effects under various robustness checks using extended DiD methods. Across multiple model specifications, such as the omission of anticipation periods (Columns 1-2), exclusion of Egypt (Column 3), and shifting (forward) treatment timing by six months (Column 4), the coefficient on JBIT_F remains consistently positive and statistically significant, ranging from 0.163 to 0.255. These stable results support the causal interpretation of BIT effectiveness, even when accounting for potential early-treatment bias and highly treated outliers (Goodman-Bacon, 2021; Wooldridge, 2023). Moreover, the application of

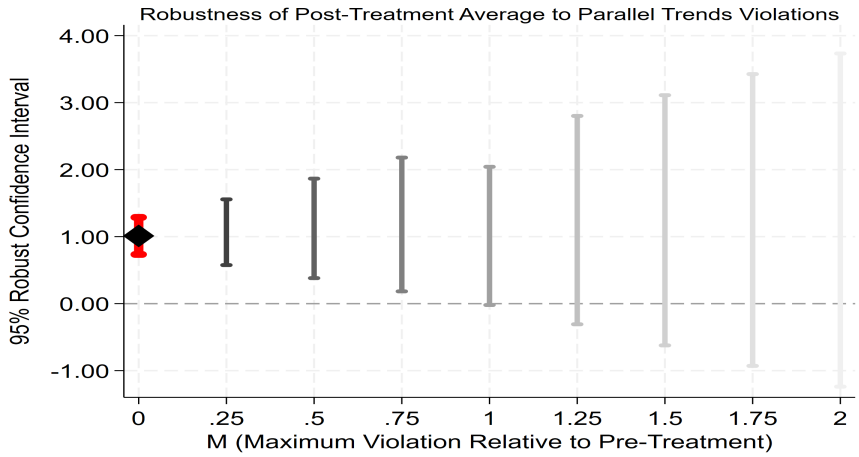
[36] When we estimate group results, Kenya presents strongly significant BIT effects (20, $p < 0.01$)

cohort and export-weighted estimators (Columns 6-7) confirms the robustness of the findings under alternative weighting schemes.[37] The heterogeneous treatment effects at the country level, especially for Kenya, suggest that institutional and policy contexts of FDI type shape the extent to which BITs enhance trade.

Sensitivity Analysis of DID: Parallel Trend Violations

Following Rambachan and Roth, (2023), we conduct a formal sensitivity analysis to assess the robustness of our DiD estimates to potential violations of the parallel trends assumption. Rather than assuming parallel trends holds exactly, we employ a partial identification approach that bounds possible post-treatment violations of parallel trends relative to observed pre-treatment trends. Here, we use the relative magnitude bound $\Delta^{RM}(\bar{M})$, which restricts the maximum post-treatment violation of parallel trends to be no more than $\bar{M}$ times the maximum pre-treatment violation. Figure B5 presents the resulting 95% robust confidence intervals for the average post-treatment effect. The black diamond at $\bar{M} = 0$ represents the conventional confidence interval assuming exact parallel trends, which shows a positive and statistically significant effect.

Figure B5: Parallel Trend Violations: $JBIT_F$ Effects on Export



Note: Robust confidence intervals using the bounding method of Rambachan and Roth, (2023) implemented in Stata's `honestdid` package, varying $\bar{M}$ from 0 to 2 in increments of 0.25. Each interval corresponds to a different bound $\bar{M}$ on the maximum post-treatment violation relative to pre-treatment violations. The black diamond shows the original estimate under exact parallel trends ($\bar{M} = 0$).

This sensitivity analysis formalizes the intuition from our event-study plots while providing a quantitative measure of robustness. Our key finding is that the treatment effect remains statistically significant at the 95% confidence level for all values of $\bar{M} < 1$.[38] However, when $\bar{M} \geq 1$ (meaning we allow post-treatment violations of parallel trends to be as large as or larger than the maximum pre-treatment violation), the confidence interval includes zero, and we can no longer reject a null effect. This establishes a clear *breakdown value* for our causal conclusion: our finding of a significant positive effect on exports is robust to allowing post-treatment trends to deviate from pre-trends by up to, but not exceeding, the magnitude of the maximum pre-treatment violation.

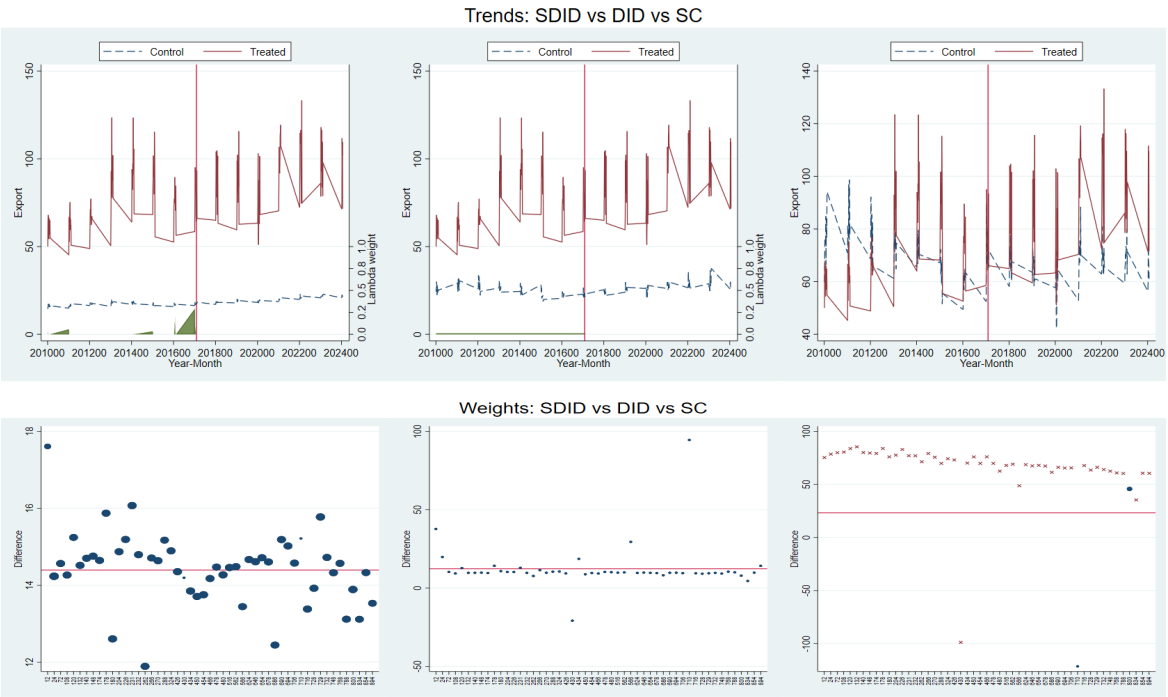
[37] The inclusion of interaction terms with Chinese trade in Column 5 shows that the estimated BIT effects are not confounded by external shocks or overlapping trade influences, but the interaction term is to drive the general result, presenting positive with statistically insignificant. Additionally, the jackknife-adjusted estimate in Column 8 provides insignificant result, addressing concerns about standard error reliability (Hansen, 2024).

[38] The breakdown at $\bar{M} = 1$ suggests that if confounding factors in the post-treatment period are believed to be more than one times larger than those observed in the pre-treatment period, our conclusion of a positive treatment effect would no longer hold.

Synthetic Control Analysis

The standard DID approach relies on a key assumption that *treatment and control groups would have followed parallel trends in the absence of the policy*. When this assumption is potentially violated, the Synthetic Control Method (SCM) provides a complementary and more flexible identification strategy. Rather than relying on a pre-defined control group, SCM constructs a data-driven counterfactual by forming a weighted combination of untreated units that closely reproduces the treated unit's pre-intervention trajectory. In our application, we construct a "synthetic Kenya" using a donor pool of African countries that did not sign a BIT with Japan during the sample period. The weights are chosen to match Kenya's pre-BIT export dynamics from Japan as closely as possible. The divergence between Kenya's actual post-BIT outcomes and those of its synthetic counterpart can therefore be interpreted as the causal effect of the Japan–Kenya BIT, under the assumption that no other concurrent shocks differentially affected Kenya relative to the donor pool.

Figure B6: Trends in Impact of BIT on Japanese Exports: Kenya vs. Synthetic Kenya



Note: The top panel compares actual Japanese exports to Kenya (solid red line) with the counterfactual synthetic control (dashed blue line). The vertical line marks the BIT enforcement period (201709). The bottom panel shows the country-specific contributions to the synthetic control, where dot size represents the assigned weight. An X denotes countries receiving zero weight. The consistent post-2017 gap across SDID, DID, and SC estimators points to a positive treatment effect of the BIT. The SDID estimator remains applicable in settings with staggered adoption. Therefore, results for other African BIT countries (Mozambique, Morocco, and Côte d'Ivoire) are available upon request.

We follow modern SCM standards (Arkhangelsky et al., 2021), employing the synthetic difference-in-differences estimator.[39] To ensure a clean comparison, we exclude from the donor pool any African country that signed its own BIT with Japan during our sample (Egypt, Mozambique, Morocco, and Côte d'Ivoire). This prevents the policy shock of interest from contaminating our counterfactual. We estimate the model using three tools: Synthetic Control (SC), Difference-in-Differences (DID), and Synthetic DID (SDID). The results, presented in Figure B6, tell a consistent story.

Export: Before 201709, the BIT entered into force, the synthetic control (the dashed line) closely tracks Kenya's actual export trend (the solid red line). This strong pre-treatment fit validates our

[39] Implementation uses the Stata package from Clarke et al., (2024).

method, showing that synthetic Kenya is a credible stand-in for what would have happened without the treaty. After 201709, a clear and persistent gap emerges. Kenya's actual exports rise above the path predicted by its synthetic counterpart (counterfactual in Figure B6). This visual divergence indicates that Japanese exports to Kenya grew more than they would have in the absence of the BIT. In other words, without the BIT, the observed increase in exports would not have occurred. Thus, the BIT had a significant and positive effect on Japanese exports to Kenya.

Annual Model: Aggregation Results

To complement our high-frequency monthly analysis, we aggregate the data to an annual level. Although this reduces the granularity of pinpointing exact treaty implementation timings within a given year, it offers a stable and transparent overview of the treatment effects, facilitating a clearer presentation of year-on-year outcomes. For robustness, we employ two complementary causal inference approaches: the Forward Difference-in-Differences (FDID) method and the Synthetic Control Using Lasso (SCUL) method.[40]

We focus on key representative countries identified in Table 3. Kenya and Côte d'Ivoire are major destinations for Japanese exports, while Kenya and Mozambique are key sources of Japanese imports. This selection allows us to examine whether BIT effects are symmetric across trade directions and whether they depend on country-specific institutional and strategic contexts. We first examine Japanese exports, followed by Japanese imports.

Japanese Export to Kenya and Côte d'Ivoire: Figure B7 presents the annual export trends for Kenya and Côte d'Ivoire.[41] The SCUL model demonstrates a strong pre-treatment fit for both countries, with remarkably low RMSE values (0.003 for Kenya and 0.001 for Côte d'Ivoire). The synthetic control trajectories closely mirror actual Japanese exports prior to the BIT enforcement in 2017 (Kenya) and 2021 (Côte d'Ivoire). This high fidelity underscores SCUL's flexibility: its LASSO-based weighting scheme leverages a broad donor pool, including negatively weighted controls, to accurately reconstruct counterfactual paths. Post-treatment, both countries exhibit clear and persistent positive deviations from their synthetic counterparts, yielding average treatment effects on the treated of 47 and 29 (Figures B7b & B7d), respectively.

In contrast, the FDID model, which constructs counterfactuals from a simple average of selected control countries, shows a satisfactory pre-treatment fit for Côte d'Ivoire but performs less convincingly for Kenya, where the synthetic path deviates noticeably even before the BIT (Figures B7c & B7a). This divergence highlights a limitation of equally weighted averaging when pre-treatment trends are complex or idiosyncratic. Nonetheless, in both cases, the post-BIT gap remains positive, corroborating the export-enhancing effect of BITs.

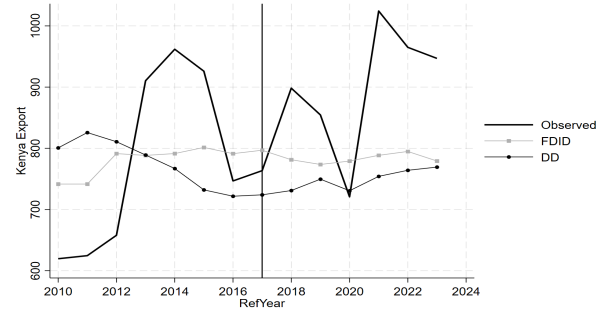
Japanese Import from Kenya and Mozambique: Table B8 shifts focus to Japanese imports, examining Kenya and Mozambique.[42] Here, both FDID and SCUL models perform well, with each generating synthetic controls that closely track actual Japanese import values before BIT enforcement (2017 for Kenya, 2014 for Mozambique). The consistency across methods lends additional credibility to the Japanese import-side results. After treaty implementation, imports rise above the counterfactual level in both countries, indicating that BITs not only boost Japanese exports but also strengthen import linkages—likely through enhanced supply-chain integration and resource-seeking FDI.

[40] FDID (Li, 2023) operates within the DID framework, using a forward selection algorithm to choose a relevant subset of control countries and then applying a simple, equally-weighted average. In contrast, SCUL (Hollingsworth and Wing, 2020) is a machine-learning extension of the synthetic control method. It uses LASSO regression with cross-validation to assign flexible, data-driven weights to a high-dimensional donor pool, allowing for extrapolation and the use of negatively correlated controls.

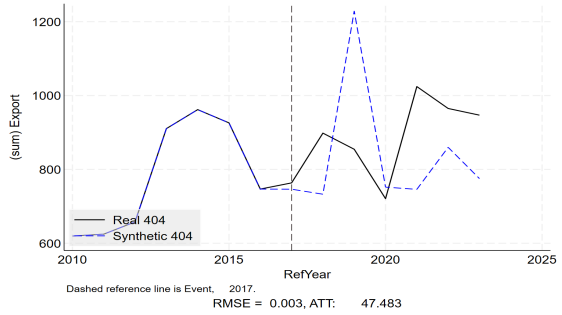
[41] Notably, to ensure a clean counterfactual, the donor pool excludes African countries that implemented BITs with Japan during the sample period (Egypt, Mozambique, Morocco, and Côte d'Ivoire when Kenya is treated, and vice versa).

[42] Notably, the donor pool for each treated country excludes other African nations that implemented BITs with Japan during the sample period, ensuring a clean counterfactual.

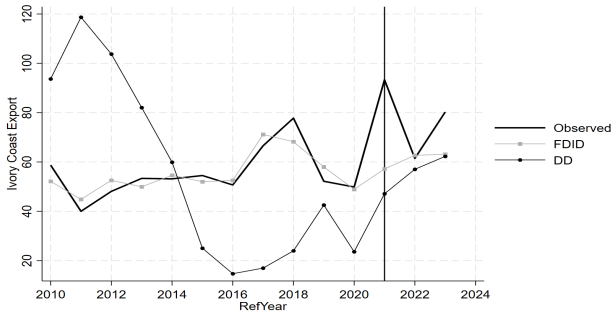
Figure B7: Fitted/Predicted Annual Distributions: Japan's Export to Kenya and Côte d'Ivoire



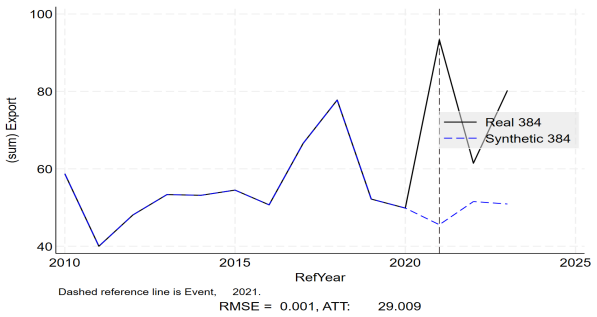
(a) FDID Model: Kenya



(b) SCUL Model: Kenya



(c) FDID Model: Côte d'Ivoire

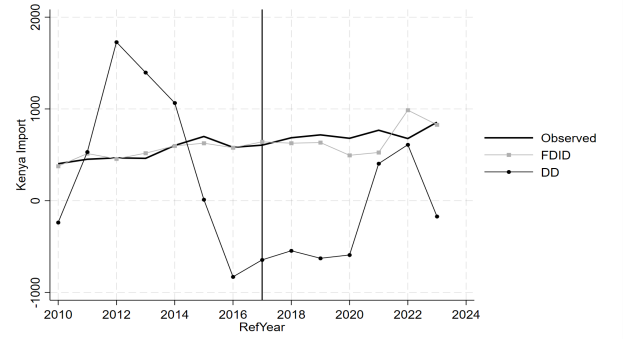


(d) SCUL Model: Côte d'Ivoire

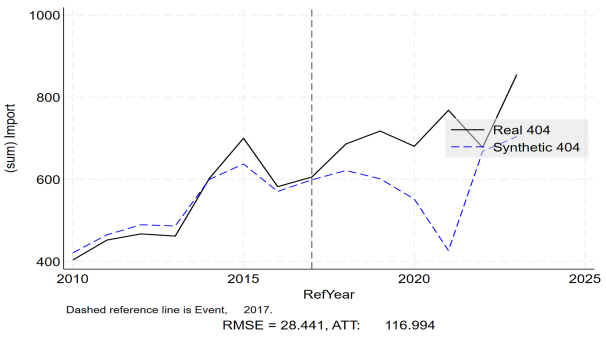
Note: We employ two models: Forward Difference-in-Differences (FDID) and Synthetic Control Using Lasso (SCUL). The FDID model selects a subset of control units for a simple average, while SCUL uses penalized regression (LASSO) to assign flexible weights to a high-dimensional donor pool. The dashed vertical line marks the policy event years (2017 and 2021). Country codes 404 and 384 represent Kenya and Côte d'ivoire.

The annual aggregation reinforces our core findings: Japan's BITs generate significant, positive trade effects in strategically aligned African partners. The superior performance of SCUL in export analysis underscores the value of machine-learning-enhanced synthetic controls in policy evaluation, especially when treatment units have unique pre-intervention trajectories. Importantly, the results are not uniform: Kenya exhibits robust responses in both exports and imports, reflecting its institutional readiness and diversified economic engagement with Japan. Côte d'Ivoire shows strong its import gains, while Mozambique responds notably on the its export side, each reflecting distinct sectoral and investment profiles. Overall, this synthetic control analysis advances our causal estimation and clearly demonstrates that BITs can successfully promote trade integration when host-country conditions, such as institutional quality, sectoral complementarity, and strategic alignment, are conducive to Japanese investment and supply-chain strategies.

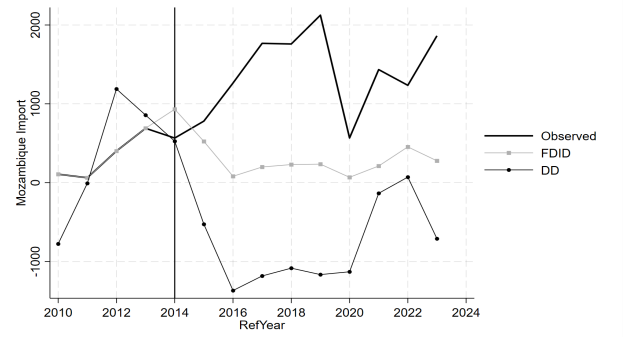
Figure B8: Annual Distributions of Japan's Import from Kenya and Mozambique: Fitted/Predicted



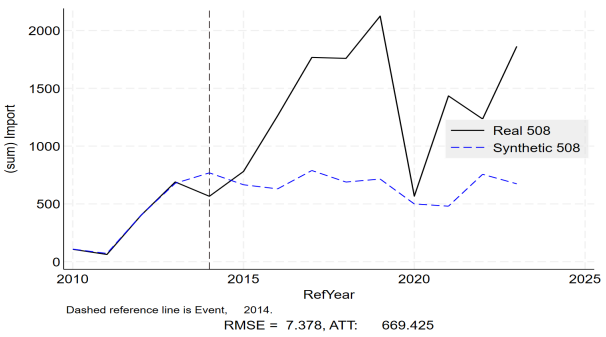
(a) FDID Model: Kenya



(b) SCUL Model: Kenya



(c) FDID Model: Mozambique



(d) SCUL Model: Mozambique

Note: We employ two models: Forward Difference-in-Differences (FDID) and Synthetic Control Using Lasso (SCUL). The FDID model selects a subset of control units for a simple average, while SCUL uses penalized regression (LASSO) to assign flexible weights to a high-dimensional donor pool. The dashed vertical line marks the policy event years (2017 and 2014). Country codes 404 and 508 represent Kenya and Mozambique.

Appendix B.2 Estimation of the Chinese Perspective

Chinese Trade with Africa: To complement our analysis of Japanese trade, we extend the investigation by estimating how BITs signed by China and Japan influence Chinese trade with Africa. This allows us to assess the interplay between the two countries' investment diplomacy and how it affects China's commercial footprint on the continent. As an estimation strategy, equation of PPML can be presented following:

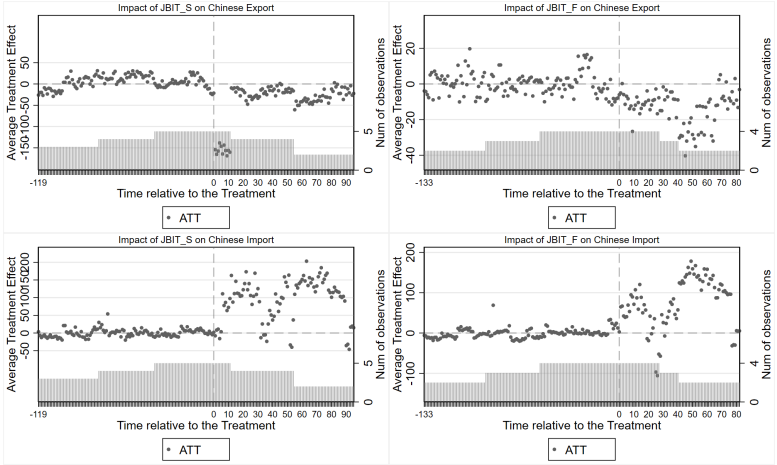
$$\text{ChTra}_{iptm} = \exp\left[\beta_1 \text{JBIT}_{itm} + \beta_2^{\text{TWFE}} \text{ChBIT}_{itm} + \beta_3 \text{JTra}_{itm} + \beta_4 X_{itm} + \delta_{ip} + \theta_{tm}\right] \varepsilon_{iptm} \quad \text{(B2.1)}$$

where ChTra_{iptm} denotes Chinese trade with country i at product p, period (t and m). JBIT_{itm} and ChBIT_{itm} are dummy variables for Japan's and China's BITs, respectively. JTra_{itm} is a control for Japanese trade activity. X_{itm} is a interaction varibales (`ChBIT#JTra`). δ_{ip} and θ_{tm} are country-product and year-month fixed effects, and ε_{iptm} is the error term. This specification allows us to isolate how BITs—both signed and enforced—affect Chinese trade outcomes, while also accounting for the influence of Japanese trade as a potential competitor or strategic complement.

Baseline Results: Table B4 reports the baseline estimates of Chinese exports and imports to Africa using both OLS and PPML estimators. Columns (1)–(4) focus on enforced BITs (ChBIT_F), while Columns (5)–(8) examine signed-but-not-enforced BITs (ChBIT_S). The regression results indicate that ChBIT are positively and significantly associated with increased Chinese exports across most model specifications. For example, in Column (1), the OLS coefficient on ChBIT is 52.44, and in Column (2), the PPML estimate is 0.326—both highly significant at the 1% level. These findings suggest that China's investment agreements exert a strong pro-trade effect, consistent with prior literature emphasizing the trade-enhancing role of BITs (Heid and Vozzo, 2020). In contrast, JBIT show a predominantly negative and statistically significant effect on Chinese exports, especially in the OLS models. This indicates a potential trade diversion effect, whereby Japan's deeper investment ties may shift market opportunities away from Chinese exporters in African partner countries.

Figure B9 illustrates this dynamic more clearly, showing that Chinese exports tend to decline in countries where Japan has an enforced BIT, while Chinese imports from those countries increase. This asymmetry aligns with the interaction results in Table 1, where the term `JBIT#ChExp` exhibits a statistically significant negative effect on Japanese exports. These patterns support the interpretation that Japan's investment treaties may indirectly disadvantage Chinese trade, particularly in the export domain, reflecting a form of competitive displacement in third-country markets.

Figure B9: Estimated Average Treatment Effects of JBIT on Chinese Trade with Africa



However, the analysis also reveals an important moderating effect when accounting for bilateral trade flows between China and Japan. The inclusion of the interaction term $ChBIT\#JpExp$ yields positive and statistically significant coefficients—such as 0.821 in OLS and 0.110 in PPML

(Columns 3–4)—implying that Chinese BITs may strengthen China's ability to counteract Japan's growing commercial footprint. This suggests that China's investment agreements not only stimulate trade in their own right but may also serve as a strategic tool to maintain export competitiveness amid overlapping geopolitical and economic interests. Overall, these results highlight the complex interplay between bilateral investment policies and trade flows, where BITs function not only as trade facilitators but also as instruments of strategic positioning in contested markets.

The second panel of Table B4 shows that both ChBIT and JBIT significantly increase Chinese imports from Africa. For example, the PPML coefficients on JBIT are around 0.63 to 0.68 across models (all significant at 1%), while those on ChBIT range from 0.319 to 0.444. This suggests that Chinese BITs not only encourage export activity but also facilitate African supply chains into China, possibly through resource-seeking or efficiency-seeking investments. Unlike in the export regressions, the interaction term `ChBIT#JpImp` does not yield significant results, indicating that Japan's import activity may exert less competitive pressure on China's import patterns. These findings provide a nuanced view of how China's BITs operate within the broader geopolitical and commercial landscape. BITs remain an effective instrument of China's trade diplomacy, particularly in promoting exports. However, the apparent negative spillovers from Japanese BITs suggest an intensifying rivalry for African market share. Overall, China's BITs have a tangible impact on trade outcomes in Africa but operate within a competitive landscape shaped by Japan's parallel diplomatic and economic engagements.

Table B4: Baseline Results of Chinese Trade Value

Dependent Variable	Chinese Export Value							
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	BIT Enforced				**BIT Signed Only**			
JBIT	-10.91***	-0.135	-11.58***	0.300**	-77.87***	-1.560***	-81.17***	-1.546***
	(3.468)	(0.144)	(3.510)	(0.139)	(15.63)	(0.179)	(15.60)	(0.197)
ChBIT	52.44***	0.326**	42.82***	0.247	-41.02*	0.0786	-57.49**	-0.433*
	(10.44)	(0.146)	(10.81)	(0.158)	(22.89)	(0.231)	(23.31)	(0.243)
JpExp	-0.0128	0.00588***	-0.285***	-0.107***	0.0218	0.00671***	-0.331***	-0.133***
	(0.0634)	(0.000781)	(0.0619)	(0.0114)	(0.0642)	(0.000725)	(0.0698)	(0.0161)
ChBIT#JpExp			0.821***	0.110***			0.987***	0.138***
			(0.165)	(0.0112)			(0.160)	(0.0158)
Pseudo/R^2	0.607	0.812	0.609	0.831	0.608	0.816	0.611	0.837
Dependent Variable	Chinese Import Value							
JBIT	89.34***	0.629***	89.40***	0.630***	107.3***	0.678***	107.2***	0.677***
	(13.06)	(0.0767)	(13.06)	(0.0767)	(12.28)	(0.0779)	(12.28)	(0.0779)
ChBIT	15.66***	0.444***	15.30***	0.436***	21.05**	0.319***	20.60**	0.315***
	(4.817)	(0.0717)	(4.808)	(0.0723)	(8.301)	(0.102)	(8.264)	(0.102)
JpImp	-0.00497	-4.95e-05***	-0.0145	-0.000214	-0.00494	-4.79e-05***	-0.0111	-0.000104
	(0.00992)	(1.37e-05)	(0.0126)	(0.000286)	(0.00992)	(1.37e-05)	(0.0174)	(0.000282)
ChBIT#JpImp			0.00976	0.000165			0.00629	5.66e-05
			(0.0158)	(0.000286)			(0.0200)	(0.000282)
Pseudo/R^2	0.773	0.770	0.773	0.770	0.774	0.771	0.774	0.771
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i, δ_{tm}, δ_r)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,365	7,427	9,365	7,427	9,365	7,427	9,365	7,427

Notes: ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are reported in parentheses. Columns (1–4) refer to BITs that have officially entered into force (ChBIT_F), while Columns (5–8) relate to BITs that are signed but not yet enforced (ChBIT_S). Interaction terms (ChBIT#JpExp / ChBIT#JpImp) capture the influence of Japanese trade on the BIT effect. Models control for country-industry, time-month, and region fixed effects. Dataset spans January 2010 to June 2024. Source: Authors' calculation.

Appendix B.3 Upstream-ness and Economic Complexity as GVC Position

Analytical Framework: To understand how investment treaties shape not only trade volumes but also the quality and sophistication of trade, we integrate two complementary measures of Global Value Chain (GVC) positioning: *upstream-ness* (UJ) and *economic complexity* (ECJ). Upstream-ness captures how far a product is from final consumption—higher values indicate goods further "up" the chain, such as intermediate inputs—while economic complexity reflects the breadth and sophistication of a country's export basket (Antràs et al., 2012; Hausmann et al., 2013). Formally, we adjust bilateral trade flows by each industry's upstream-ness or complexity score:

$$UJ_{iptm}^{\text{trade}} = \frac{JTra_{iptm}}{\sum_{pm} JTra_{iptm}} U_{ip}, \quad ECJ_{iptm}^{\text{trade}} = \frac{JTra_{iptm}}{\sum_{pm} JTra_{iptm}} EC_i, \tag{B3.1}$$

where $JTra_{iptm}$ denotes Japan's trade in product p with partner i at period tm, U_{ip} is the industry level upstream index[43], and EC_i is the country-level complexity index[44]. By merging these metrics with our Panel A (HS-1) and B (HS-2) datasets—following the methodology of Ariu and Ogliari (2023)—we capture how BITs influence trade intensity of Japan's role in higher-value and more sophisticated segments of African GVCs.

We estimate the impact of Japan's BITs (JBIT) and China's BITs (ChBIT) on these adjusted trade measures using a two-way fixed effects PPML model, supplemented by OLS for comparison:

$$JY_{iptm} = \exp\left[\beta_1 \text{JBIT}_{iptm} + \beta_2 \text{ChBIT}_{iptm} + \beta_3 \text{ChY}_{iptm} + \mathbf{X}_{iptm} + \delta_{ip} + \delta_{tm}\right] \varepsilon_{iptm}, \tag{B3.2}$$

where JY_{iptm} is either UJ_{iptm}^{trade} or $ECJ_{iptm}^{\text{trade}}$, ChY_{iptm} controls for Chinese trade intensity, X_{iptm} includes interaction terms such as $JBIT\#UChExp$ that further test whether China's upstream exports condition the effectiveness of Japanese BITs. Lastly, δ_{ip}, δ_{tm} are country-industry and year-month fixed effects.

Baseline Results: This analysis explores how Japanese BITs in force (JBIT_F) shape the structure of Japan's trade, focusing on two key dimensions: upstream-ness, which reflects a good's position early in the value chain, and economic complexity, indicating the knowledge intensity embedded in traded products. Results from Table B5 show that JBIT_F has a statistically significant and economically meaningful effect on both dimensions. Specifically, the positive coefficients on JBIT_F across export and import models suggest that these treaties facilitate Japan's deeper integration into global value chains. In the PPML estimates, JBIT_F raises upstream-ness by approximately 18–37% (Column 2) and enhances trade complexity by up to 58% (Column 6), implying a shift toward more sophisticated, intermediate trade. Contrary to expectations that increased upstream positioning may involve simpler goods, the results reveal simultaneous gains in complexity, highlighting Japan's role as a supplier of technologically advanced components used early in production processes.

The interaction term between JBIT_F and China's export complexity (JBIT × ECChExp) is both positive and significant, indicating that Japanese BITs are particularly effective in enhancing export sophistication in markets where China also exports complex goods (Columns 7-8). This suggests a complementary strategic dynamic rather than direct competition, with Japan and China coexisting at the higher end of value chains. On the import side, the effect of JBIT_F on economic complexity

[43] Our preference aligns with Antràs et al. (2012), emphasizing larger and more diverse goods and countries. Specifically, our focus is centered on goods, encompassing approximately 300 industries in the US tables and coefficient of upstream-ness index across over African countries. We have condensed this information into roughly 100 industries based on HS-2-digit classifications, which are then multiplied by each country's position in GVC. However, we did prefer data sources covering 44 OECD countries by Antràs and Chor, (2018); Mancini et al., (2024).

[44] The Economic Complexity Index, sourced from the Harvard Atlas of Economic Complexity. It considers the range of products a country exports (diversity) and the number of countries capable of producing those products (ubiquity). A higher ECI suggests a more complex and sophisticated export structure, indicative of advanced productive capabilities within the economy.

appears weaker and only marginally significant, indicating that Japan's import structure is less responsive to China's presence. Interestingly, China's own BITs (ChBIT_F) exert minimal direct influence on Japan's trade structure, apart from a slight negative effect on export complexity, perhaps hinting at marginal competitive displacement in advanced sectors. Overall, these findings underscore how investment treaties actively shape the nature—not just the volume—of trade, by enabling strategic upgrading and repositioning within global supply chains.[45]

Table B5: Baseline Result of Upstream-ness and Economic Complexity, BIT Enforced

Dependent Variable	**Japanese Export Characteristics: UJpExp & ECJpExp**							
Estimator	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
	Upstream-ness of Export (UJpExp)				**Economic Complexity of Export (ECJpExp)**			
JBIT_F	0.00231**	0.169**	0.00269***	0.199***	0.00261***	0.261***	-0.00889***	-0.352***
	(0.00101)	(0.0716)	(0.00101)	(0.0716)	(0.000743)	(0.0597)	(0.000856)	(0.0783)
ChBIT_F	-0.000294	-0.0307	-0.000301	-0.0311	-0.00154**	-0.0824	-0.00165***	-0.0937*
	(0.000821)	(0.0553)	(0.000821)	(0.0553)	(0.000611)	(0.0509)	(0.000611)	(0.0510)
UChExp	0.00368	0.198	0.00392	0.218	-0.0158***	-1.300***	-0.0158***	-1.287***
	(0.00642)	(0.452)	(0.00649)	(0.453)	(0.00403)	(0.359)	(0.00400)	(0.357)
JBIT#UChExp			-0.0246	-1.887			0.869***	41.50***
			(0.0185)	(1.239)			(0.0262)	(3.477)
R^2/Pseudo R^2	0.090	0.0158	0.090	0.0158	0.302	0.0105	0.311	0.0111
Dependent Variable	**Japanese Import Characteristics: UJpImp & ECJpImp**							
	Upstream-ness of Import (UJpImp)				**Economic Complexity of Import (ECJpImp)**			
JBIT_F	0.00454***	0.313***	0.00522***	0.350***	0.00618***	0.465***	0.00869***	0.606***
	(0.00135)	(0.0985)	(0.00156)	(0.109)	(0.000965)	(0.0837)	(0.00157)	(0.118)
ChBIT_F	0.00238	0.207	0.00237	0.206	0.00316	0.298	0.00314	0.295
	(0.00249)	(0.203)	(0.00249)	(0.203)	(0.00269)	(0.217)	(0.00269)	(0.217)
UChImp	-0.00809	-0.873	-0.00756	-0.819	-0.000449	-0.0742	0.00242	0.163
	(0.00871)	(1.019)	(0.00878)	(1.025)	(0.0146)	(1.370)	(0.0148)	(1.369)
JBIT#UChImp			-0.0416	-2.280			-0.148**	-8.440*
			(0.0744)	(5.004)			(0.0688)	(4.563)
R^2/Pseudo R^2	0.026	0.0200	0.026	0.0200	0.098	0.0192	0.098	0.0193
Panel A	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1	HS-1
FE (δ_i, δ_{tm})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9365	9365	9365	9365	8388	6196	8388	6196

Notes: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are in parentheses. This analysis examines the impact of Bilateral Investment Treaties (BITs) that have entered into force (`BIT_F`) on the Upstream-ness and Economic Complexity of Japanese trade with African countries. The dataset spans from January 2010 to June 2024. Both OLS and PPML estimators are used to address heteroskedasticity and the presence of zero trade flows. Columns (1–4) report estimates for Upstream-ness, while Columns (5–8) focus on Economic Complexity. All regressions include fixed effects for country (δ_i) and time (δ_{tm}). **Source:** Author's calculations.

[45]We also conducted a sectoral heterogeneity analysis based on upstreamness (UJ) and economic complexity (ECJ) using HS-2 level panel data. However, these results were not statistically significant and are therefore not reported in the main text. The complete findings are available from the author upon request.

Appendix B.4 Conceptual Framework of Model: Trade, BITs, and Spillovers

Setup of the Consumers and Firms: We develop a multi-country model with heterogeneous firms to analyze how BITs affect trade flows and generate competitive spillovers. The framework builds on Melitz, (2003) and incorporates elements from the global sourcing literature (Antràs and Helpman, 2004; Markusen, 2002). Consider a world with countries indexed by $i, j, k \in J$. Consumers in each country have constant elasticity of substitution (CES) preferences over differentiated varieties:

$$U_j = \left(\int_{\omega \in \Omega} q_j(\omega)^{\frac{\sigma-1}{\sigma}} \, d\omega \right)^{\frac{\sigma}{\sigma-1}}, \qquad \sigma > 1 \tag{B4.1}$$

where σ is the elasticity of substitution between varieties. This yields demand in country j for a variety ω produced in country i:

$$q_{ij}(\omega) = \frac{p_{ij}(\omega)^{-\sigma}}{P_j^{1-\sigma}} Y_j, \qquad P_j = \left(\int_{\omega \in \Omega} p_j(\omega)^{1-\sigma} d\omega \right)^{\frac{1}{1-\sigma}} \tag{B4.2}$$

where P_j is the price index and Y_j is total expenditure in country j, in which also equals the income (X_j) from its firms' sales regarding Walras' law (Helpman et al., 2004). Each firm in country i is characterized by productivity φ, drawn from a Pareto distribution as $F(\varphi) = 1 - (\varphi/\underline{\varphi})^{-\theta}$ with $\theta > \sigma - 1$. When selling abroad, a firm with productivity φ faces unit labor cost as $w_i \tau_{ij} / \varphi$ to serve country j, where w_i is the wage in i and $\tau_{ij} \geq 1$ is an iceberg trade cost (Eaton and Kortum, 2002).

Mode-specific profit functions: Under monopolistic competition (Melitz, 2003), the firm charges a constant markup over marginal cost as $p_{ij}(\varphi) = \frac{\sigma}{\sigma-1} \cdot \frac{w_i \tau_{ij}}{\varphi}$, and the revenue from selling to country j is $r_{ij}(\varphi) = p_{ij} q_{ij} = \left(\frac{\sigma}{\sigma-1} \frac{w_i \tau_{ij}}{\varphi} \right)^{1-\sigma} \frac{Y_j}{P_j^{1-\sigma}}$. Thus, the profit from exporting becomes $\pi_{ij}^X(\varphi) = \frac{r_{ij}(\varphi)}{\sigma} - f_{ij}^c$, where f_{ij}^c is the fixed cost of exporting. The zero-profit cutoff productivity φ_{ij}^* satisfies $\pi_{ij}^X(\varphi_{ij}^*) = 0$, so only firms with $\varphi \geq \varphi_{ij}^*$ serve market j by exporting.

BITs as Trade Cost Reducers: We model a BIT between countries i and j as reducing both variable and fixed trade costs as $\tau_{ij} = d_{ij} \cdot e^{-\alpha \cdot \text{BIT}_{ij}}$ & $f_{ij}^c = \bar{f}_{ij} \cdot e^{-\beta \cdot \text{BIT}_{ij}}$, respectively. Briefly, a firm can choose FDI by incurring fixed cost f_{ij}^F and paying the host wage w_j to produce locally. Its profit $\pi_{ij}^F(\varphi)$ yields a cutoff $\varphi_{ij}^F \geq \varphi_{ij}^*$ (since typically $f_{ij}^F \geq f_{ij}^c$), defined by $\pi_{ij}^F(\varphi_{ij}^F) = 0$, reflecting that investment is more expensive than exporting.[46]

Aggregate Level: Bilateral exports and FDI from country i to j aggregate over the surviving firms. Regarding the Pareto productivity distribution, $X_{ij} \propto M_i \int_{\varphi_{ij}^*}^{\infty} \varphi^{\sigma-1} f(\varphi) \, d\varphi \propto M_i (\varphi_{ij}^*)^{-(\theta-(\sigma-1))}$, where M_i measures the size of i's firm population. Using the cutoff condition gives the familiar gravity form $X_{ij} \propto M_i \, Y_j \, (w_i \tau_{ij})^{-(\sigma-1)}$ so exports decline with trade costs at elasticity.[47]

Gravity Equation with Aggregate Trade

Aggregate exports from i to j integrate over firms above the productivity cutoff:

$$X_{ij} = M_i \int_{\varphi_{ij}^*}^{\infty} r_{ij}(\varphi) \, dF(\varphi), \tag{B4.3}$$

[46] We delve into details and distinguish two perspectives of export vs FDI explained in Box 1 regarding Appendix B.5.

[47] The aggregate trade flow from i to j equal to $\propto M_i \int_{\varphi_{ij}^F}^{\infty} \varphi^{\sigma-1} f(\varphi) \, d\varphi \propto M_i (\varphi_{ij}^F)^{-(\theta-(\sigma-1))}$, yielding $\propto M_i \, Y_j \, (w_i \tau_{ij})^{-(\sigma-1)}$ though with the higher cutoff (φ_{ij}^F) reflecting the larger fixed cost (f_{ij}^F). if we introduce BITs by assuming bilateral treaties lower the effective cost of investment. Let $BIT_{ij} = 1$ if countries i and j share a BIT. For example, given $f_{ij}^F = f^F e^{-\delta BIT_{ij}}$ ($\delta > 0$), so that φ_{ij}^F is reduced by factor $e^{-\delta/(\sigma-1)}$ when $BIT_{ij} = 1$. This raises the extensive margin of FDI: a BIT between i, j increases the range of firms (with lower productivity) that choose to invest in j.

Bilateral exports rise with exporter income Y_i (through the number of firms M_i) and importer size Y_j, and fall with trade cost τ_{ij}. Using the Pareto distribution and solving the integral yields the gravity equation:

$$X_{ij} = A \cdot Y_i \cdot Y_j \cdot (w_i \tau_{ij})^{-(\sigma-1)} \cdot (\varphi_{ij}^*)^{-(\theta-(\sigma-1))}, \tag{B4.4}$$

Box 1: Global Sourcing Perspective

Theoretical and empirical work shows that firms often export to regions where they also operate affiliates, creating a complementary link between trade and FDI (Antràs et al., 2024a,b; Conconi et al., 2024). A typical pattern is that a firm establishes a subsidiary abroad and exports intermediate inputs to it for further processing, fragmenting production across borders to exploit cost advantages or other efficiencies (Grossman and Rossi-Hansberg, 2008). Building on this "trade-FDI complementarity" in goods markets, we consider the firm's decision to serve a foreign market j either through **exports** or through **horizontal FDI**.[a] In the export case, a firm produces in i and ships to j, facing iceberg trade costs $\tau_{ij} > 1$ and a fixed market-entry cost f_{ij}^X. Operating profits becomes as $\pi_{ij}^X(\varphi) = \left(\frac{\sigma}{\sigma-1}\frac{w_i\tau_{ij}}{\varphi}\right)^{1-\sigma}\frac{Y_j}{\sigma P_j^{1-\sigma}} - f_{ij}^X$. In the FDI case, the firm establishes an affiliate in j, avoiding trade costs but paying the higher fixed cost $f_{ij}^I > f_{ij}^X$. Profits then become $\pi_{ij}^I(\varphi) = \left(\frac{\sigma}{\sigma-1}\frac{w_j}{\varphi}\right)^{1-\sigma}\frac{Y_j}{\sigma P_j^{1-\sigma}} - f_{ij}^I$.

BITs alter these conditions by lowering international operating costs. Specifically, BITs reduce fixed costs of establishing affiliates as $f_{ij}^I = \bar{f}^I \cdot e^{-\beta \cdot \text{BIT}_{ij}}, \quad \beta > 0$, and can also reduce variable trade costs via regulatory alignment as $\tau_{ij} = d_{ij} \cdot e^{-\alpha \cdot \text{BIT}_{ij}}, \quad \alpha \geq 0$. Following Helpman et al., (2004), two productivity cutoffs arise: φ_{ij}^X (minimum productivity for exporting profitably) and φ_{ij}^I (for FDI, with $\varphi_{ij}^I > \varphi_{ij}^X$). BITs reduce both thresholds, $\frac{\partial \varphi_{ij}^X}{\partial \text{BIT}_{ij}} < 0$, $\frac{\partial \varphi_{ij}^I}{\partial \text{BIT}_{ij}} < 0$, thereby expanding the set of firms that engage internationally and inducing some to shift from exporting to FDI.

In the context of this paper, which targets goods trade, we stress the **complementarity** between FDI and exports. Two channels are especially relevant. First, affiliates established under BITs import intermediate goods from their parent firms, raising intra-firm exports. Second, affiliates strengthen distribution networks, market knowledge, and brand presence, which also benefit independent exporters from the same country. Under these conditions, aggregate exports from i to j can be decomposed as $X_{ij} = X_{ij}^D + X_{ij}^I$, where X_{ij}^D denotes arm's-length exports and X_{ij}^I denotes intra-firm exports. Both components increase with BITs through extensive-margin effects (more firms exporting or investing) and intensive-margin effects (higher volumes per firm).

[a] This is clearly illustrated by the case of Japanese FDI into Kenya (see Appendix B.5). Firm-level data reveals a dual structure: large-scale horizontal FDI in manufacturing (e.g., Toyota, Honda) exploits Japan's RCA in complex machinery, while market-seeking vertical FDI (e.g., sales offices, distribution centers) strengthens distribution networks, directly shaping trade flows in intermediates and finished products within GVCs (See Table 4).

Direct Effect of BITs on Trade Costs: We assume that BITs do not directly change fundamental preferences or productivities; instead, we assume a BIT between i and j effectively reduces the cost of investing (or doing business with secure investors) between those countries. In practice, we model this as a reduction in effective trade costs (or in fixed costs) associated with the BIT. Substituting BIT-modified costs ($\tau_{ij} = d_{ij} \cdot e^{-\alpha \cdot \text{BIT}_{ij}}$ & $f_{ij}^c = \bar{f}_{ij} \cdot e^{-\beta \cdot \text{BIT}_{ij}}$), and noting that φ_{ij}^* depends on both τ_{ij} and f_{ij}^c, we derive the structural gravity equation following Chaney, (2008):

$$X_{ij} = \underbrace{\Theta \cdot Y_i \cdot Y_j \cdot (w_i d_{ij})^{-(\sigma-1)}}_{\text{Standard Gravity}} \cdot \underbrace{\exp\left(\gamma \cdot \text{BIT}_{ij}\right)}_{\text{BIT Effect}}, \tag{B4.5}$$

The parameter γ_1 captures the direct trade-enhancing effect of BITs through both intensive and extensive margins:[48]

$$\gamma = \underbrace{\theta\alpha}_{\text{Intensive Margin}} + \underbrace{\frac{\theta-(\sigma-1)}{\sigma-1}\beta}_{\text{Extensive Margin}} > 0,$$

The positive sign reflects the complementarity between goods trade and FDI. This implies exports scale with $exp(\gamma)$ through a combination of $\alpha\&\beta$ when a BIT is present. This equation embodies the direct effect of a BIT on bilateral trade: by lowering entry or operational costs, a BIT between i and j increases X_{ij}. In terms of our parameters, a positive γ tends to increase trade (if BIT induces more investment that complements trade, e.g. by building supply chains), whereas a negative γ (or large enough reduction in costs) could lead to trade diversion (firms switch from exporting to FDI, reducing measured exports). The economic effect is similar to that of a pro-trade agreement or tariff reduction, scaled by the trade elasticity and productivity. This baseline extends standard gravity by making BIT enter as a negative cost term.

Competitive Spillovers and Trade Diversion

Beyond the direct bilateral effect, the model generates spillover effects through competition in third markets. Specifically, consider country i's exports to country j. If i also has BITs with some other country $k \neq j$, then some of the exportable goods from i to j might instead be produced in k. That is, investment in k (made easier by a BIT) could divert a fraction of i's market share away from j. To capture this, let country k (e.g., China) compete with country i (e.g., Japan) in market j (e.g., an African country). A BIT between k and j affects i's exports through the price index P_j, which appears in the demand function in Equation (B4.2). The price index P_j depends on all suppliers' costs:

$$P_j^{1-\sigma} = \sum_k M_k \cdot (w_k \tau_{kj})^{-(\sigma-1)} \cdot (\varphi_{kj}^*)^{\theta-(\sigma-1)}, \tag{B4.6}$$

A BIT between k and j lowers τ_{kj}, making Chinese varieties cheaper and increasing their market share. This reduces demand for Japanese varieties through two channels: **Substitution effect** and **Price index effect**. In particular, Cheaper Chinese varieties directly substitute for Japanese goods, and Lower P_j reduces markups for all firms, disproportionately affecting higher-cost suppliers. We capture these competitive spillovers by extending the gravity equation:

$$X_{ij} = \Theta \cdot Y_i Y_j \cdot (w_i d_{i_{(k)}j})^{-(\sigma-1)} \cdot \exp\left(\gamma_1 \cdot \text{BIT}_{ij} - \gamma_2 \cdot \text{BIT}_{kj} \cdot S_{kj}\right), \tag{B4.7}$$

where S_{kj} measures export similarity between k and i in market j (e.g., similarity of HS-2 export vectors, product-level RCA overlap, or pairwise bilateral similarity of sectoral shares), and $\gamma_2 > 0$ quantifies the trade diversion effect.[49] This general substitution mechanism has concrete geopolitical implications. For instance, consider Japanese and Chinese firms competing in African markets. If an African country as j signs a BIT with Japan, Japanese-exporting or -investing firms find j's market cheaper, raising Japan's exports to j at the expense of China's share. Conversely, a China–Africa BIT

[48] Briefly, starting from the zero-profit condition and solving for the cutoff productivity φ_{ij}^*, then aggregating over the Pareto distribution yields $\gamma = \theta\alpha + \frac{\theta-(\sigma-1)}{\sigma-1}\beta$, that decomposes as both intensive margin effect ($\theta\alpha$: existing firms export more due to lower variable costs) and extensive margin effect ($\frac{\theta-(\sigma-1)}{\sigma-1}\beta$: new firms enter exporting due to lower fixed costs). Please see the proof of the derivation below.

[49] If j signs a BIT with i, lowering τ_{ij}, the numerator rises relative to the denominator. Thus i takes a larger share of j's imports, and k's share falls – a trade diversion effect. Analogously, if a third country k obtains a BIT with j, then k's goods become relatively cheaper in j and displace some of i's sales. In sum, BITs reallocate market shares among suppliers: each BIT-driven cost reduction for one partner diverts imports from others.

would enhance China's position relative to Japan (see Figure 1). In short, BITs with third countries reshape bilateral flows via competitive effects.

Empirical Specification

Taking logarithms of Equation (B4.7) and incorporating fixed effects to control for multilateral resistance terms (Anderson and van Wincoop, 20003), we obtain our estimable equation:

$$\ln X_{ijt} = \delta_i + \delta_j + \delta_t + \gamma_1 \text{BIT}_{ijt} - \gamma_2 \left(\text{BIT}_{kjt} \cdot S_{kj}\right) + \epsilon_{ijt} \tag{B4.8}$$

where δ_i, δ_j, and δ_t are exporter, importer, and time fixed effects that address and absorb time-varying country characteristics and time-invariant bilateral costs. In my empirical model, bilateral trade data serves as X_{ijt}. The direct effect parameter $\gamma_1 > 0$ captures how BITs between i and j reduce costs and promote exports.[50] The parameter $\gamma_2 > 0$ indicates that competing countries' BITs reduce trade (diversion effect): BITs with other countries k reduce X_{ij} if $S_{k,j}$ is high (i.e., if k is a close substitute for j as a destination). If $\gamma_2 = 0$, BITs have only bilateral effects. A positive γ_2 implies trade diversion occurs through investment reallocation. This is particularly relevant for Japan-China competition in Africa, where China's extensive BITs and infrastructure projects may influence Japan's trade performance even indirectly (Amendolagine et al., 2024). Lastly, the spillover term may proxy for China-Africa BITs when analyzing Japan-Africa flows. In sum, this specification thus provides the theoretical foundation for our empirical analysis, linking micro-level firm decisions to aggregate trade patterns and strategic competition in international markets.

Proofs for the Derivation of the BIT Effect Parameter γ_1

We provide a derivation that maps the micro parameters governing BIT effects on variable and fixed costs (α, β) into the reduced-form trade parameter γ_1 that captures the combined intensive and extensive margin effects of BITs on trade flows. The derivation follows the standard Melitz, (2003) aggregation with a Pareto productivity distribution. As we previously reported about the revenue, zero-profit condition, and BITs reduce variable and fixed trade costs, as shown above. Substituting the revenue function can be expressed as $\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\frac{w_i\tau_{ij}}{\varphi^*_{ij}}\right)^{1-\sigma}\frac{Y_j}{P_j^{1-\sigma}} = f^c_{ij}$. Solving for the cutoff productivity appears as $\varphi^*_{ij} = \left(\frac{\sigma f^c_{ij} P_j^{1-\sigma}}{Y_j}\right)^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma-1} w_i\tau_{ij}$. Note that we have BITs reduce variable and fixed trade costs as $\tau_{ij} = d_{ij}e^{-\alpha\cdot\text{BIT}_{ij}}$, & $f^c_{ij} = \bar{f}_{ij}e^{-\beta\cdot\text{BIT}_{ij}}$. Substituting these into equation of cutoff productivity can be rewritten as:

$$\varphi^*_{ij} = \left(\frac{\sigma \bar{f}_{ij} e^{-\beta\cdot\text{BIT}_{ij}} P_j^{1-\sigma}}{Y_j}\right)^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma-1} w_i d_{ij} e^{-\alpha\cdot\text{BIT}_{ij}} \tag{B4.1.1}$$

. With Pareto-distributed productivity and aggregate exports, solving this integral yields the standard gravity form:

$$X_{ij} = M_i \frac{\theta}{\theta-(\sigma-1)} \underline{\varphi}^{\theta} \left(\frac{\sigma}{\sigma-1} w_i\tau_{ij}\right)^{1-\sigma} \frac{Y_j}{P_j^{1-\sigma}} (\varphi^*_{ij})^{\sigma-1-\theta}. \tag{B4.1.2}$$

[50] Markusen (2002) emphasizes how multinational firms respond to market size, trade costs, and scale economies. In his knowledge-capital model, MNEs choose between exporting and local production depending on these factors. In our framework, the net effect on X_{ij} can therefore be positive or negative depending on parameters. Empirical findings present mixed evidence of both substitution and complementarity between affiliate production and exports. (Baldwin and Okubo, 2014; Grossman and Rossi-Hansberg, 2008; Xiong and Sun, 2023)

First, substitute $\tau_{ij} = d_{ij}e^{-\alpha \cdot \text{BIT}_{ij}}$ into equation (B4.1.2):

$$X_{ij} = M_i \frac{\theta}{\theta - (\sigma - 1)} \underline{\varphi}^{\theta} \left(\frac{\sigma}{\sigma - 1} w_i d_{ij} \right)^{1-\sigma} e^{(\sigma-1)\alpha \cdot \text{BIT}_{ij}} \frac{Y_j}{P_j^{1-\sigma}} (\varphi_{ij}^*)^{\sigma-1-\theta}. \tag{B4.1.3}$$

Through the productivity cutoff, now substitute equation (B4.1.1) for $(\varphi_{ij}^*)^{\sigma-1-\theta}$:

$$(\varphi_{ij}^*)^{\sigma-1-\theta} = \left[\left(\frac{\sigma \bar{f}_{ij} e^{-\beta \cdot \text{BIT}_{ij}} P_j^{1-\sigma}}{Y_j} \right)^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma - 1} w_i d_{ij} e^{-\alpha \cdot \text{BIT}_{ij}} \right]^{\sigma-1-\theta}.$$

Separating the BIT effects can be expressed as follows:

$$(\varphi_{ij}^*)^{\sigma-1-\theta} \propto e^{-\alpha(\sigma-1-\theta) \cdot \text{BIT}_{ij}} \cdot e^{-\beta \frac{\sigma-1-\theta}{\sigma-1} \cdot \text{BIT}_{ij}}. \tag{B4.1.4}$$

Combining equations (B4.1.3) and (B4.1.4), the BIT effects on trade appear as:

$$X_{ij} \propto e^{(\sigma-1)\alpha \cdot \text{BIT}_{ij}} \cdot e^{-\alpha(\sigma-1-\theta) \cdot \text{BIT}_{ij}} \cdot e^{-\beta \frac{\sigma-1-\theta}{\sigma-1} \cdot \text{BIT}_{ij}}.$$

The combined exponent is written such $(\sigma-1)\alpha - \alpha(\sigma-1-\theta) - \beta\frac{\sigma-1-\theta}{\sigma-1} = (\sigma-1)\alpha - \alpha(\sigma-1) + \alpha\theta - \beta\frac{\sigma-1-\theta}{\sigma-1}$. To simplify, we can rewrite as $= \alpha\theta - \beta\frac{\sigma-1-\theta}{\sigma-1} = \alpha\theta + \beta\frac{\theta-(\sigma-1)}{\sigma-1}$. The final version of the combined parameter (γ) is:

$$\boxed{\gamma = \theta\alpha + \frac{\theta - (\sigma - 1)}{\sigma - 1}\beta}$$

The parameter γ_1 decomposes into two economically distinct components: **Intensive Margin Effect ($\theta\alpha$)** & **Extensive Margin Effect ($\frac{\theta-(\sigma-1)}{\sigma-1}\beta$)**. BITs reduce variable trade costs, allowing existing exporters to increase their sales volume. The elasticity θ comes from the Pareto distribution shape parameter. BITs lower fixed costs of market entry, enabling new firms to become exporters. The term $\frac{\theta-(\sigma-1)}{\sigma-1}$ represents how productivity heterogeneity affects the entry margin.

The condition $\theta > \sigma - 1$ ensures the extensive margin effect is positive, which is the standard parameter restriction in Melitz-type models for meaningful firm heterogeneity. This derivation provides microfoundations for how BITs simultaneously affect both margins of trade, with γ representing their combined impact on aggregate trade flows.

Appendix B.5 Japanese FDI Flows into African BIT Partners

This analysis examines whether Bilateral Investment Treaties (BITs) catalyze tangible investment surges beyond their documented trade effects, and explores the strategic nature of these investments—whether BIT-driven inflows reflect horizontal FDI (market-seeking) or vertical FDI (supply-chain integration). This dual perspective helps illuminate the mechanisms underpinning our main empirical results on trade-BIT complementarity.

Japanese FDI Activities: Beyond aggregate flows (Table A2), project-level data reveal the strategic character of Japanese investments. According to Orbis M&A data, Japan completed 70 deals with African BIT members between 2010 and 2025,[51] compared to 119 deals targeting non-BIT African economies. Kenya emerges as the dominant recipient, meriting detailed examination to connect investment flows with BIT-induced trade effects. For other BIT partners, distinct patterns emerge: Mozambique attracted large-scale extractive investments (e.g., Mitsui's USD 770 million coal mining stake in 2017); Côte d'Ivoire saw modest venture capital activity; while Morocco demonstrated remarkable sectoral diversification across IT, agribusiness, and advanced manufacturing. These patterns suggest BITs facilitate investment profiles aligned with host-country comparative advantages and Japanese strategic priorities.

Case study of Japan-Kenya BIT

Aggregated FDI: The Kenya case powerfully illustrates how Japan's BIT strategy catalyzes both investment and trade, reinforcing the competitive dynamics central to this study. The Japan-Kenya BIT, which entered into force in September 2017, serves as a critical inflection point in the investment relationship. Analyzing Japanese FDI in Kenya requires synthesizing two complementary data sources—macroeconomic flows from the Bank of Japan (BOJ) and project-level commitments from Orbis—which, despite methodological differences, reveal a coherent strategic evolution.

Table B6: Comparison of Japanese FDI Flows to Kenya: Bank of Japan vs. Orbis Data (2010-2024)

Source	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Bank of Japan Data (100 million JPY)															
Manufacturing	na	na	-1.00	-4.00	-2.14	5.81	0.54	112.82	8.64	9.47	6.67	8.91	7.18	7.05	0.18
Non-Manufacturing	na	-0.82	0.00	-6.00	0.50	1.78	2.93	1.13	0.67	2.64	2.08	–	0.25	5.71	14.54
Total BOJ FDI	**0.00**	**-0.82**	**-2.00**	**-10.00**	**-1.64**	**7.59**	**3.48**	**113.95**	**9.30**	**12.11**	**8.75**	**8.91**	**7.43**	**12.76**	**14.72**
Cumulative BOJ	**0.00**	**-0.82**	**-2.82**	**-12.82**	**-14.46**	**-6.87**	**-3.39**	**110.56**	**119.86**	**131.97**	**140.72**	**149.63**	**157.06**	**169.82**	**184.54**
Orbis Data (USD$ Million)															
Orbis OCI	80.87	153.65	200.13	898.24	725.49	5.23	49.65	10.11	493.12	13.34	n.a.	n.a.	4.08	2.60	4.33
Orbis M&A	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.10	0.60	23.70	1.15	87.75	12.00	24.00
Total Orbis FDI	**80.87**	**153.65**	**200.13**	**898.24**	**725.49**	**5.23**	**49.65**	**10.11**	**493.22**	**13.94**	**23.70**	**1.15**	**91.83**	**14.60**	**28.33**
Cumulative Orbis	**80.87**	**234.52**	**434.65**	**1,332.89**	**2,058.38**	**2,063.61**	**2,113.26**	**2,123.37**	**2,616.59**	**2,630.53**	**2,654.23**	**2,655.38**	**2,747.21**	**2,761.81**	**2,790.14**

Notes: This table compares two different Japanese FDI in Kenya through BoJ and Orbis. **Bank of Japan data** (top) uses balance of payments methodology. **Orbis data** (bottom) aggregates project-level investment values. FDI (OCI) sums the capital expenditure of greenfield, expansion, and co-location projects reported in Orbis Crossborder Investment (OCI). *FDI (M&A)* aggregates disclosed deal values from Orbis M&A (Zephyr); values were originally reported in thousands of USD and are converted here to millions. Because many M&A deals do not disclose a value, the M&A column should be interpreted as a lower-bound estimate of transactional FDI. `n.a.` indicates missing or undisclosed deal value. Unlike BOJ data, OCI reports individual project-level capital expenditures (e.g., greenfield and expansion investments) without netting out reverse flows, and thus does not reflect negative values. Currency: BOJ data in 100 million JPY; Orbis data in USD millions. Cumulative totals calculated from annual flows. **Sources:** BOJ; Orbis Crossborder Investment; Orbis M&A (Zephyr); compiled by author.

As detailed in Table B6, the BOJ and Orbis data capture different dimensions of investment. The BOJ data, based on balance-of-payments principles (BPM5/BPM6), records net financial flows including equity, reinvested earnings, and intercompany debt, and can show negative values due to

[51] Of these, 24 deals occurred in Egypt, 39 in Kenya, 5 in Morocco, 1 in Mozambique, and 1 in Côte d'Ivoire. No deals were recorded for Angola or Zambia during the study period.

disinvestment or loan repayments. In contrast, Orbis captures gross investment commitments through announced capital expenditures (OCI) and disclosed M&A values. This methodological distinction explains apparent discrepancies, such as in 2017 when the BOJ recorded a massive surge of 114 billion JPY (reflecting the consolidated financial impact of BIT enforcement) while Orbis OCI showed modest project-level activity. Synthesizing these sources reveals a clear narrative: the pre-BIT period (2010-2016) featured cautious net flows (BOJ) alongside significant but sporadic project investments (Orbis), particularly large-scale manufacturing ventures by Toyota and Honda (2013-2014). The BIT's enforcement in 2017 correlated with a structural break—consolidating financial commitments (BOJ) while enabling strategic diversification across investment modes (Orbis), consistent with the trade-FDI complementarity mechanisms outlined in our conceptual framework (Appendix B.4).

Crossborder FDI Projects:

This subsection presents a structured overview of Japanese foreign direct investment (FDI) projects in Kenya between 2010 and 2025, based on data from the Orbis Crossborder Investment (OCI) database. Across the 15-year period, 42 FDI projects were identified, spanning a wide array of sectors such as manufacturing, retail, logistics, healthcare, and consumer services (Table B7). These projects reflect a steady and diversified engagement by Japanese firms, illustrating Japan's evolving investment footprint in Kenya. The most prominent period of FDI intensity occurred between 2013 and 2014, when Japanese firms undertook several large-scale manufacturing ventures. Key players such as Toyota Motor Corporation, Honda, Nissan, and Nissin Foods spearheaded major investments in vehicle assembly and food production. Notably, multiple projects during this phase exceeded USD 180 million in capital expenditure and individually created up to 970 jobs, signaling not only high-value investments but also significant employment impact in Kenya's industrial sector.

Table B7: Japanese Foreign Direct Investment in Kenya, 2010-2024

Category	Projects	Total CapEx (USD million)	Total Jobs	Avg. CapEx (USD million)
A. Temporal Distribution				
2010–2014 (Industrial Boom)	18	2,537.4	10,940	141.0
2015–2019 (Diversification)	20	583.1	2,469	29.2
2020–2024 (Market Access Shift)	4	10.9	42	2.7
B. Sectoral Distribution				
Manufacturing	10	2,806.3	8,330	280.6
Sales Offices	22	98.9	525	4.5
Retail	5	6.0	38	1.2
Logistics	2	49.3	400	24.7
Regional HQs	2	163.6	400	81.8
Data Centre	1	149.4	200	149.4
Healthcare	1	39.5	200	39.5
Maintenance	1	69.2	150	69.2
C. Strategic Investment Phases				
Large-Scale Manufacturing (CapEx > $100M)	10	2,806.3	8,330	280.6
Market-Access and Sales Expansion	22	98.9	525	4.5
Strategic Infrastructure & Services	6	422.1	950	70.4
Grand Total	**42**	**3,122.9**	**13,429**	**74.4**

Notes: This table consolidates all Japanese FDI projects in Kenya from 2010 to 2024 based on Orbis Crossborder Investment (OCI) data. Panel A groups investments by three distinct temporal phases: the *industrial boom* (2010–2014) marked by large-scale manufacturing; a *diversification phase* (2015–2019) with broader sectoral coverage; and a *market-access phase* (2020–2024) emphasizing lean commercial operations. Panel B provides the sectoral distribution, showing that manufacturing accounted for nearly 90% of total capital expenditure but less than one-quarter of total projects. Panel C highlights strategic patterns, underscoring Japan's dual approach: industrial capacity building through heavy manufacturing and incremental market penetration via service and sales-oriented FDI. *Source:* Orbis Crossborder Investment (Moody's Analytics), accessed July 2025. Compiled by author.

Over the full period, Toyota Tsusho emerged as the most consistent investor, with a broad

operational footprint that includes retail outlets, logistics hubs, production facilities, and even a regional headquarters. Other notable investors, such as Mitsubishi Motors, Nikon, Panasonic, and Ebara Pumps, focused primarily on opening sales and service offices in Nairobi, indicating growing interest in the Kenyan consumer and professional markets. From 2010 to 2024, total Japanese FDI in Kenya through greenfield and co-location projects is estimated to have surpassed USD 3.5 billion, generating over 12,000 jobs. While the early years were marked by large-scale manufacturing and industrial infrastructure, the post-2020 phase has seen a marked pivot toward leaner, market-access-driven investments, such as retail shops, service centers, and sales offices. This transition likely reflects both Kenya's growing middle class and shifting Japanese investment strategies toward low-capex, high-growth urban sectors.

These investments strongly reflect horizontal FDI, where Japanese firms replicate their domestic operations abroad, establishing local manufacturing that serves local consumer markets. Some investments reflect vertical FDI, especially those tied to logistics capabilities or distribution networks (e.g., Toyota Tsusho setting up regional hubs or Isuzu Motors establishing after-sales facilities) to control value-chain stages locally. A few projects involve co-location, where firms add new business lines in the same city, such as data centres next to existing manufacturing sites, illustrating deeper operational integration.

Mergers & Acquisitions Activities

Complementing the analysis of greenfield and co-located FDI from Orbis Crossborder Investment, this subsection examines a distinct channel of Japanese investment in Kenya: mergers, acquisitions, and joint ventures, based on data from the Orbis M&A (Zephyr) database. While Crossborder Investment highlights the physical establishment of new operations, such as production plants, retail outlets, or regional headquarters, Orbis M&A captures transactional FDI: changes in corporate ownership, minority equity stakes, and co-investment structures (Table B8). These deals often do not involve new fixed capital formation, but instead reflect strategic entry into the Kenyan market through financial and managerial control of existing enterprises.

Between 2010 and 2025, we identify 39 M&A transactions involving Japanese acquirors and Kenyan firms. This activity is temporally clustered, with a clear surge in 2020 (9 deals), coinciding with accelerated digital transformation during the COVID-19 pandemic. Subsequent years, particularly 2021 (3 deals) and 2022 (6 deals), also show continued momentum, driven in large part by Japanese venture capital interest in Kenya's startup ecosystem. The investment modes vary: most deals (15) are minority stakes with unspecified ownership levels, typically linked to early-stage financing. Others include 100% joint ventures (4 cases) and majority or full acquisitions, such as Isuzu's 57.7% stake in General Motors East Africa. A few deals involve named minority stakes, such as a 15% equity investment by Sumitomo Corporation in Powergen Renewable Energy. This diversity in deal types reflects a dual-track strategy: Japanese firms are simultaneously engaging in exploratory, small-scale investments in emerging sectors and committing to deeper operational integration through majority control or co-ownership in established ventures. These are best viewed as horizontal or forward vertical FDI, enabling Japanese firms to integrate with Kenyan distribution or service networks.

Sectorally, the transactions are heavily skewed toward "Other services" (14 deals), encompassing fintech, SaaS platforms, healthtech, and consulting—sectors emblematic of Kenya's growing innovation ecosystem. This is followed by wholesale & retail trade (4 deals) and machinery and equipment (3 deals), often linked to industrial support services or transport infrastructure. The presence of only one deal in food and beverages signals limited interest in traditional consumer manufacturing through M&A, as opposed to greenfield modes. Notably, many of the high-value deals target technology firms with scalable platforms, underlining Japan's shifting focus from heavy industry toward digital and knowledge-based investments.

Japan-Kenya BIT: The Kenyan case crystallizes the dual function of Japan's BITs as both an

Table B8: Japanese Mergers and Acquisitions in Kenya, 2010-2025

Category	Deals	Disclosed Value (USD thousand)	Avg. Deal Size (USD thousand)	Deals with Disclosed Value	Primary Deal Type
A. Temporal Distribution					
2015-2019 (Early Phase)	8	1,200	150	4	Mixed (JV/Acquisition)
2020-2022 (Tech Boom)	20	111,395	5,570	18	Minority Stake
2023-2025 (Maturation)	9	38,000	4,750	5	Minority Stake/JV
B. Sectoral Distribution					
Technology Services	22	140,095	6,368	22	Minority Stake
Machinery & Equipment	3	24,000	8,000	3	Minority Stake
Wholesale & Retail	3	n.a.	n.a.	0	Acquisition/JV
Healthcare	2	n.a.	n.a.	0	Joint Venture
Printing & Publishing	3	3,650	1,217	3	Minority Stake
Other Sectors	4	n.a.	n.a.	0	Mixed
C. Strategic Investment Types					
Venture/Startup Funding	24	144,745	6,031	24	Minority Stake
Strategic Partnerships	6	n.a.	n.a.	0	Joint Venture
Market Consolidation	7	6,000	1,000	3	Acquisition
Grand Total	**37**	**150,745**	**6,213**	**27**	**Minority Stake (66.7%)**

Notes: This table provides a comprehensive overview of Japanese M&A activity in Kenya based on Orbis M&A (Zephyr) data. Panel A shows three distinct temporal phases: early market entry (2015-2019), technology investment surge (2020-2022), and market maturation (2023-2025). Panel B reveals sectoral concentration with technology services dominating both deal count (61.1%) and disclosed value (92.9%). Panel C categorizes investments by strategic intent, highlighting Japan's focus on venture funding for Kenya's startup ecosystem. Deal values in current USD thousands; 75% of deals have disclosed values. *Source:* Orbis M&A (Zephyr, Bureau van Dijk/Moody's Analytics), accessed July 2025. Compiled by author.

economic catalyst and a strategic geopolitical instrument. The Japan-Kenya BIT, by providing legal security, triggered a structural shift from cautious engagement to confident, multi-modal integration. Japanese investment evolved beyond large-scale horizontal FDI (e.g., Toyota assembly plants) into a sophisticated blend of vertical integration and strategic equity stakes in high-growth digital platforms. This diversified approach, combining industrial capacity building with innovation-focused venture activity, deepens Kenya's integration into Japanese value chains—a key mechanism driving the significant trade gains documented in our main results. It forges a sustainable, private-sector-led partnership model that aligns with Kenya's development goals and strategically differentiates Japan's engagement from China's state-led, infrastructure-focused expansion. Kenya thus serves as a paradigm for how BITs can be leveraged to secure strategic footholds and reshape competitive dynamics in emerging economies.[52]

[52]This pattern aligns with Japan's broader diplomatic and economic priorities under initiatives such as TICAD and the Free and Open Indo-Pacific strategy, and complements Kenya's national development agenda, particularly in manufacturing and job creation.

References

Anderson J.A., Van Wincoop E. (2003). Gravity with Gravitas: A solution to the Border Puzzle. *American Economic Review*, 93, 170-192

Antràs, P., and Chor, D. (2018). On the measurement of upstream-ness and downstreamness in global value chains. *World Trade Evolution: Growth, Productivity and Employment*, 5, 126-194.

Antras, P., and Helpman, E. (2004). Global sourcing. In *Journal of political Economy*, 112(3), 552-580.

Chaney, T. (2008). Distorted gravity: the intensive and extensive margins of international trade. In *American economic review*, 98(4), 1707-1721.

Clarke, D., Pailanir, D., Athey, S., and Imbens, G. (2024). On synthetic difference-in-differences and related estimation methods in Stata. In *The Stata Journal*, 24(4), 557-598.

Eaton, J., and Kortum, S. (2002). Technology, geography, and trade. *Econometrica*, 70(5), 1741-1779.

Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Chung, S., Jimenez, J., Simoes, A., and Yildirim, M. (2013). The Atlas of Economic Complexity. Cambridge, MA: MIT Press.

Helpman, E., Melitz, M. J., and Yeaple, S. R. (2004). Export versus FDI with Heterogeneous Firms. *American Economic Review*, 94(1), 300–316.

Hollingsworth, A., and Wing, C. (2020). Tactics for design and inference in synthetic control studies: An applied example using high-dimensional data. *SSRN Electronic Journal*.

Li, K. T. (2023). Frontiers: A simple forward difference-in-differences method. *Marketing Science*, 42(4), 768–784.

Markusen, J. R. (2002). Multinational firms and the theory of international trade. *MIT press*.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6), 1695-1725.

Rambachan, A., and Roth, J. (2023). A more credible approach to parallel trends. *Review of Economic Studies*, 90(5), 2555-2591.