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BUILDING AND STUMBLING BLOCKS IN GLOBAL SUPPLY CHAINS: AN EMPIRICAL ANALYSIS OF TRADE AGREEMENTS BETWEEN NORTH AND SOUTH COUNTRIES

Haroon Rashid
CANPACK US
amberharoon@outlook.com
Pennsylvania, USA

Abstract

This paper extends the Gravity Model of Trade to analyze the heterogeneous effects of Trade Agreements (TAs) between North and South countries on supply chain dynamics. Focusing on manufacturing trade flows from 2000 to 2010, the study examines how these agreements influence trade volumes and the unit value of exported goods. The research reveals that while average trade benefits from such agreements align with existing literature, there are notable variations based on the type of agreement and region. In particular, North-South agreements demonstrate both positive and negative impacts on supply chain efficiency and product value, which is crucial for companies optimizing their global supply chains. The study's findings suggest that regional differences must be considered when evaluating the potential of trade agreements to enhance supply chain operations in a globalized economy.

IndexTerms—Gravity Model of Trade, Trade Agreements, North-South Trade, Supply Chain Dynamics, Manufacturing Trade Flows, Global Supply Chains, Trade Volumes, Unit Value of Exports, Regional Trade Variations, Supply Chain Efficiency.

I. INTRODUCTION

The proliferation of Trade Agreements (TAs) since the early 1990s has been Ill documented in the international trade academic literature ([1] Dahi & Demir, 2013; [2] Mayda & Steinberg, 2007). This trend has slowed down since the 1990s but it has not stopped. Figure 1 shows the historical evolution of TAs, showing the dramatic increase in the 1990s.

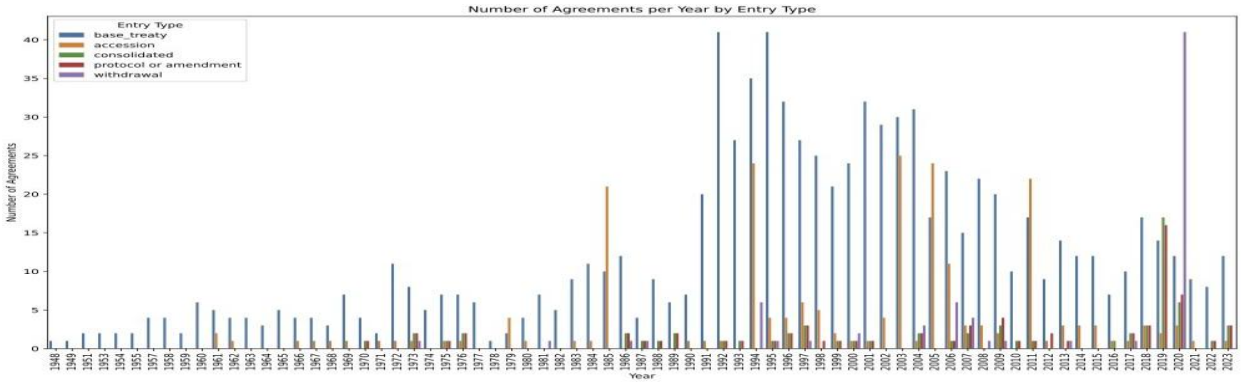

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Fig. 1. Trade Agreements Per Year. Source: Visualization made by author. Data by The Design of International Trade Agreements Database (DESTA).

Moreover, the vast majority of TAs have been signed between developing countries, what is referred to as "South-South" trade cooperation, covering an increasinglysignificant share of global trade across industries. Figure 2 shows the historical evolution of South-South TAs, Figure 3 shows the historical evolution of North-South TAs, and Figure 4 shows the historical evolution of North-North TAs, showcasing the significant difference in the number of agreements and countries belonging to each group.

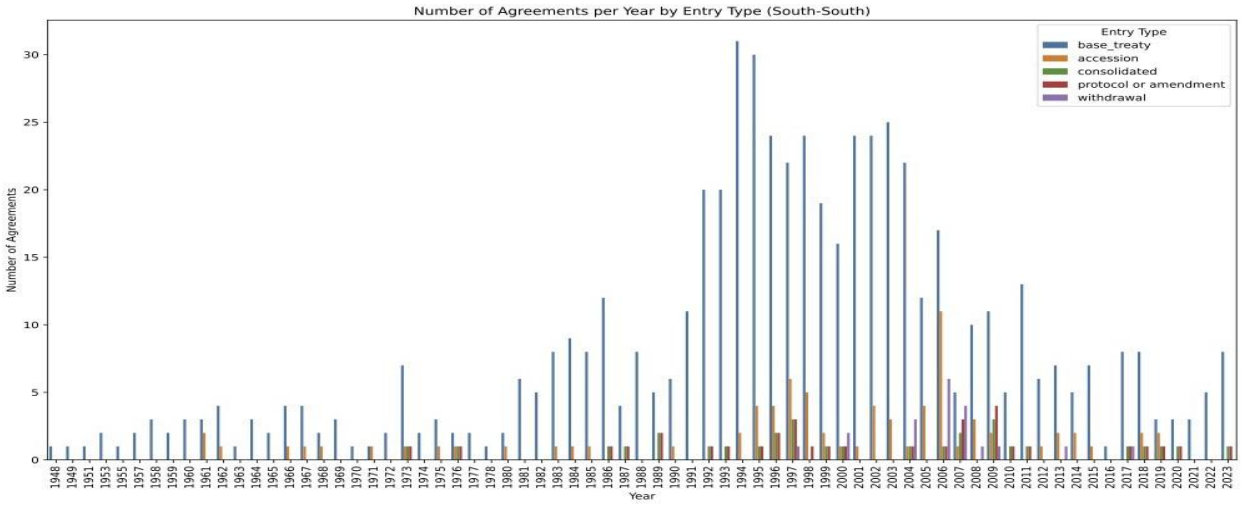

Fig. 2. Trade Agreements Per Year (South-South).Source: Visualization made by author. Data by The Design of International Trade Agreements Database (DESTA).

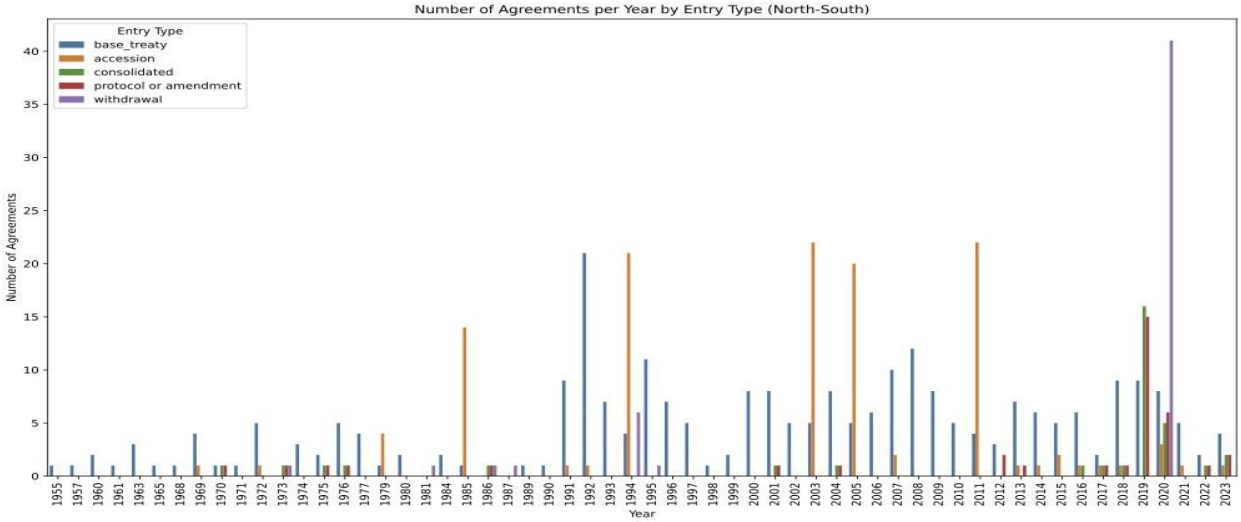

Fig. 3. Trade Agreements Per Year (North-South).Source: Visualization made by author. Data by The Design of International Trade Agreements Database (DESTA).

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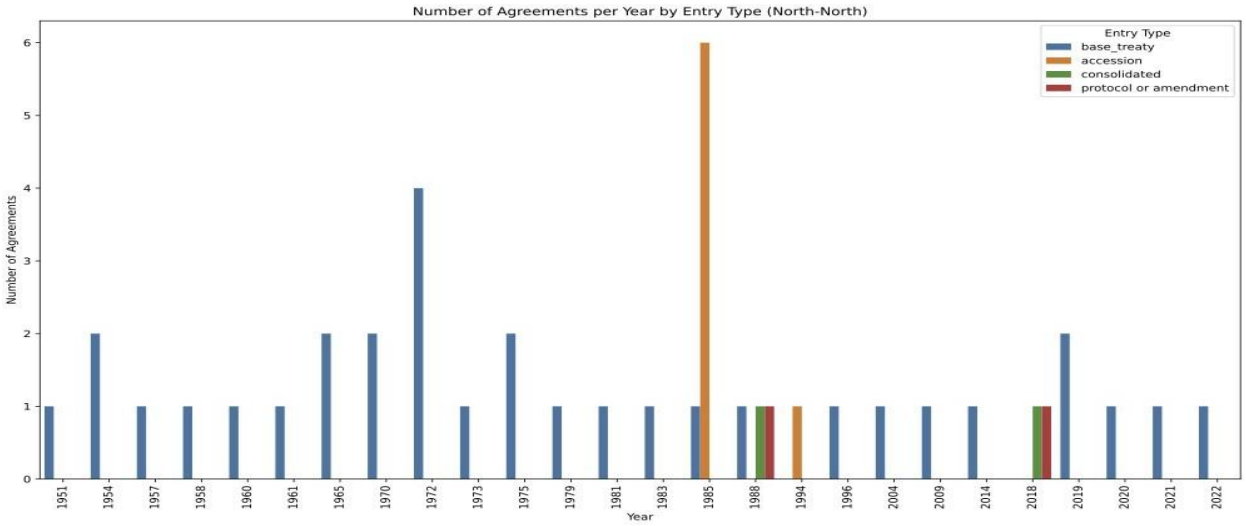

Fig. 4. Trade Agreements Per Year (North-North).Visualization made by author. Data by The Design of International Trade Agreements Database (DESTA).

Despite their apparent importance for the governments of developing countries, a common view in the academic literature is that South-South TAs are not as effective as North-South TAs, or even that they do not achieve significant effects, making them largely symbolic ([3] Gamso & Postnikov, 2022). North-South agreements, signed between developed and developing countries, are presented as a superior alternative, more effectively leading to increased trade for its members and quality upgrading through learning-by-exporting dynamics and better access to intermediate goods for developing countries. At the same time, other strands of the international trade literature present South-South TAs as a more effective platform for developing countries to grow, at least to a level where they can take advantage of North-South cooperation without being undermined by more influential powers. This debate is often presented as a dichotomy, where South-South TAs are either building or stumbling blocks for developing countries. Solving it will go a long way in better informing developing countries about which agreements they should enter, with what types of partners, and how the agreement should be designed.

In this paper, I venture to analyze this dichotomy empirically through the use of a gravity model of trade and subsequent extensions in order to get estimates for the effects of specific TAs, as well as estimates on the effects of TAs on South-South, North-South and North- North bilateral trade relationships, relative to non-TA- members. I also explore the use of the export product unit value (EPUV) as an alternative to trade volume in order to capture the effects of TAs on the value per unit exported of manufacturing goods. As such, I aim to answer two specific research questions: do South-South TAs act as building blocks or stumbling blocks to developing countries? Are they preferable to North-South agreements?

This research is related to literature on comparative advantage from traditional trade theory to new trade theory and classical development theory on the potential dynamic and scale effects of TAs and to more recent literature on the relevance of the structure of the productspace exported and the extensive margin of trade.

The paper proceeds in section 2 with a review of the relevant theoretical and empirical literature on the effects of TAs on North-South and South-South trade and potential development implications. Section 3 introduces my empirical methodology and data. Section 4 presents and describes my main findings, and Section 5 analyses and discusses their potential implications and how they fit within the relevant literature. Finally, Section 6 concludes.

II. LITERATURE REVIEW

This section reviews the literature on the theoretical and empirical potential effects of TAs on exports and Welfare and situates the analysis in the relevant field of research.

A.Theoretical Framework

The relevant theoretical framework in the literature is often described as a dichotomy, where TAs are either stumbling or building blocks in the development path of developing countries.

1.Comparative Advantage and Trade Creation and Diversion: Traditional trade theory emphasizes trade creation (allowing cheaper products from TA members to substitute for more expensive domestic products) and trade diversion (substituting products from non-TA members that are cheaper before the TA with products from TA members that are cheaper now due to the TA reducing tariffs) ([4] Schiff, Winters and Schiff, 2003) and argues that the impact of TAs depends on the comparative advantage of member countries. In particular, it argues that TAs magnify the impacts of a country's comparative advantage, relative to the world and to other member countries signatories of a common TA. If member countries of a TA have a comparative advantage on a factor endowment relative to the world, but one country also has a comparative advantage on the same factor endowment relative to the other member countries, the country with the "extreme" advantage will be more vulnerable to trade diversion effects, while countries with "intermediate" advantages will gain from trade creation effects, predicting divergence of trade outcomes, and winners and losers among member countries. ([5] Venables, 2003). This emphasis on the trade creation and trade diversion effects among member countries with significant differences in the comparative advantage of their factor endowments relative to the world and to each other, suggests that, when the country with the "extreme" comparative advantage is a high-income country, relative to a lower-income country with an "intermediate" comparative advantage, the low- income country should seek a TA with the other high- income country as it will gain more. On the contrary, if both members are low-income countries, the country with the "extreme" comparative advantage should not seek a TA with the other low-income member country as it will be vulnerable. ([6] Sanguinetti, Siedschlag and Martincus, 2010). This logic can be easily extended to theNorth-South and South-South types of TAs, as

"North" countries will reasonably have an "extreme" comparative advantage in skill-intensive goods relative to "South" countries, while "South" countries will reasonably have an "extreme" comparative advantage in labor-intensive goods relative to "North" countries. Furthermore, it is also argued in the literature that benefiting from economies of scale through South-South economic integration is more difficult because member countries do not have complementary production and trade structures, nor high interpenetration of each other's markets on intra-industry trade. ([4] Schiff, Winters and Schiff, 2003). Also, South countries can benefit from greater technological diffusion from North-South TAs as the "North" countries have higher industrial development as Ill as investment in research ([7] Schiff and Wang, 2008). Finally, as the trend in manufacturing has been in favor of vertical specialization or value chain fragmentation ([8] Krugman, 1995), North- South TAs are preferable as developing countries strive to capture a greater portion of the value added. Based on these arguments, developing countries should therefore be better off entering into North-South rather than South- South agreements.

2.Economies of Scale, Input-Output linkages and Products Exported: In contrast, classical development theory and new trade literature go beyond the static welfare gains from trade creation and diversion effects when analyzing the effect of TAs. Developing countries can use TAs to overcome limitations of their domestic market size in the industrialization process ([1] Dahi and Demir, 2013). Such potential increases in the effective market size could help industries in developing countries achieve economies of scale and increase the skill content of production and exports, which in turn could improve the market penetration of exports of developing countries in developed markets in industrial products ([9] Fugazza and Robert-Nicoud, 2006). Also, due to similarities in production patterns and resource base among developing countries, incentivizing trade by lowing barriers could facilitate appropriate technology transfer, according to the needs of developing countries ([10] UNIDO, 2006). Of particular relevance for developing countries, it is argued that the products that countries export matter for long-term economic performance. If a country exports products from industries that are more technology-intensive, these are likely to create input-output linkages and spillover effects in human and physical capital accumulation and innovation ([11] Hausmann, Hwang and Rodrik, 2007). Furthermore, by allowing for factor accumulation, TAs can reduce intra-block trade barriers and increase competition and access to cheaper intermediate goods, triggering changes in industrial production in member countries. As such, TAs among "South" countries can reduce intra-South barriers and lead to industrialization of the region ([12] Puga and Venables, 1998). In this context, what matters are not static gains from TAs, but dynamic gains in industrial development. IfSouth-South TAs truly promote industrial development of member countries, they might be desirable even if there are short-term losses due to trade diversion ([1] Dahi and Demir, 2013). Other arguments in the development literature emphasize the asymmetries in bargaining powerbetween "North" and "South" countries, which could lead to worse outcomes for developing countries if their policy space gets restricted ([13] Thrasher and Gallagher, 2008). To the extent that these arguments hold true, developing countries could be better off entering into South-South rather than North-South agreements, or at least should pursue both kinds of agreements.

B. Relevance of the Structure of Product Space

As a compliment to trade theory, new trade theory and classical development theory, there is a recent strand of the academic literature that emphasizes the importance of the structure of the product space exported by each country in the structural transformation process. Beyond factor endowments of physical, human and institutional capital, and their subsequent evolution through accumulation processes, as the basis for the comparative advantage of countries, this literature proposes and finds evidence of patterns of path dependence depending on the current capabilities of countries, and the relatedness of current capabilities to the capabilities required to produce new products in the future ([14] Hausmann and Klinger, 2007). As it is observed that human capital for one product is imperfectly substitutable for other products, and the degree of substitutability determines the relatedness of products, the implication is that, as countries experience a strong tendency to move into related products that require the capabilities that a country already has or that are similar, the opportunities for future transformation are dictated by the current product space and its proximity to related products. Moreover, it also implies that there is a positive exponential relationship between the returns to the accumulation of new capabilities and the capabilities present in a country. ([15] Hausmann and Hidalgo, 2010). The more diverse the product structure of a country, the higher the returns to accumulate new capabilities. Inversely, I can find a "trap of economic stasis", in which countries with few capabilities have little incentives to accumulate new capabilities as they will have negligible or no returns, predicting a world of divergence in industrial development. Furthermore, this literature suggests that countries converge to the level of income determined by their productive structures and how complex they are ([16] Hidalgo and Hausmann, 2009). An underlying assumption of this literature is that what a country exports matter and signals valuable information about a country's comparative advantage and productive structure, not only on its current industries and capabilities, but also on a component of the evolution of its comparative advantage based on the relatedness to other industries and capabilities ([17] Hausmann et al., 2014). The implications of thisliterature to the effects of TAs appears to be relevant to the extent that TAs can help countries acquire new capabilities and diversify their structure of product space. Logically, although North-South trade has the largest potential to allow South countries to acquire new capabilities, I expect that the highest returns should be made by acquiring capabilities in industries and products related to the current capabilities of countries, which in the context of my research should occur between countries with related productive structures. As such, South-South trade could function as a building block for developing countries to acquire new capabilities and diversify the structure of their product space, before they can take advantage of acquiring new capabilities through North-South trade.

C. Empirical Evidence

The preference of a type of partner in a TAs then becomes an empirical question. Do South-South TAs promote trade and industrial development among their members? The empirical literature overall reports positive effects of TAs on the trade of member countries, but with considerable heterogeneity on the estimation coefficients. For example, a meta-analysis of research papers on the effects of TAs on member trade, encompassing 85 papers and 1827 estimates, finds an

average of 0.59 (an 80% increase in trade), with a median of 0.38 (a 46% increase in trade), a wide range of coefficient estimates (-9.01 to 15.41), and only 312 out of 1827 estimates reported as negative ([18] Cipollina and Salvatici, 2010). Furthermore, a survey of the empirical research on the effect of economic integration agreements on international trade flows, as Ill as using the most modern econometric techniques to address biases, found an increase of 50% on international trade, but with significant variation in the effects of specific agreements ([19] Kohl, 2014). However, much of the empirical research is focused on the effects of TAs on or including the most advanced economies. Empirical research focused exclusively on the effects of South-South TAs or comparing them to the effects of North-North or North-South TAs, is much less prevalent in the literature. Although, several research papers do control for the type of agreement (North-South or South- South) and have found positive and significant effects of South-South TAs ([20] Medvedev, 2006; [2] Mayda andSteinberg, 2007; [1] Dahi and Demir, 2013; [21] Demeand Ndrianasy, 2017), these articles tend to be limited in their scope, sample size or only focus on trade volumes. Using firm-level data, empirical literature studying trade outcomes using unit values of exports reports evidence of the value per unit increasing as the income level of the importing nation increases ([22] Hallak, 2006; [23] Bastos and Silva, 2010). Relevant to my analysis, one article finds evidence that the same firms export their products at a higher value per unit the higher the income level of the importing nation ([24] Manova and Zhang, 2012). Beyond providing evidence that the direction of trade hasimmediate repercussions, this could also provide evidence in favor of North-South TAs, as they can generate more revenue and promote quality upgrading ([25] Dahi and Demir, 2017). At the same time, other strands of the empirical research literature emphasize the importance of similarities in trade structure and preferences and provide evidence that countries of similar levels of income, technology and endowments have higher levels of trade, and importantly, more potential for convergence and spillovers ([26] Hallak, 2010). Important for my discussion of the structure of product space, empirical research finds that trade between similarly endowed countries have more diversified exports between them, relative to trade with countries with different endowments ([27] Regolo, 2013), and that countries with neighbors with shared or similar comparative advantages will experience an increase in the export of similar products to the neighboring country ([28] Bahar, Hausmann and Hidalgo, 2014). If similarity between countries is highly relevant for knowledge transfer, South-South TAs can potentially be more beneficial for developing countries.

III. METHODOLOGY

A. Empirical Strategy

1.**The Gravity Model of Trade:** Often referred as the "workhorse" of international trade, the gravity model is prominent in the empirical literature of applied international trade analysis. Among the arguments that could support the use of the gravity model, there are four that are particularly relevant for my purposes. First, the gravity model of trade is intuitive to understand. Following the metaphor of Newton's Law of Universal Gravitation, it predicts that international trade between two countries is directly proportional to the product of their economic size, and inversely proportional to trade frictions between them. In simpler words, the bigger (smaller) the

economies of two countries, and the easier (harder) it is for them to trade with each other, the more (less) I expect them to trade. Second, it is referred to as a structural model with solid theoretical foundations, which makes it appropriate for counterfactual analysis, such as measuring the effects of trade policies as I aim to do with the effects of North- South versus South-South agreements. Third, the model has a flexible structure, which will allow me to construct a specification tailored to my research. Finally, fourth, it holds consistent and remarkable predictive power, both with aggregate and sectoral data ([29] Yotov et al. 2016). Through the decades, the gravity equation has been regularly upgraded in the theoretical and empirical literature. Of relevance, the simple intuition of the gravity model was theoretically extended by Anderson to note that, after controlling for size, the increase or decrease is relative to the average barriers of the two countries with all their partners, which are referred as "multilateral resistance" ([30] Anderson 1979). The more trade barriers or resistance to trade exists with other countries relative toa given partner, the more a country is pushed to trade with said partner. Anderson also introduced the assumptions of product differentiation by place of origin, and Constant Elasticity of Substitution (CES) expenditures, or theArmington-CES assumption ([29] Yotov et al. 2016; [31] Chatzilazarou and Dadakas 2023), which led me to today'sgeneralized form of the gravity equation, as developed and popularized by Anderson and van Wincoop ([32] Anderson and van Wincoop 2003).

Equally important, several empirical developments have strengthened the gravity model and inform my choice of methodology: Exporter-time and importer-time fixed effects are used to account for the multilateral resistance terms in a gravity estimation with panel data ([33] Olivero and Yotov 2012). As the gravity model is often estimated with an OSL estimator, zero-trade flows are dropped from the sample when trade is transformed into a logarithmic form. Also, trade data is recognized to suffer from heteroscedasticity ([29] Yotov et al. 2016). To solve for zero-trade flows and heteroscedasticity, the Poisson Pseudo Maximum Likelihood (PPML) estimator has been proposed to estimate the gravity model, avoiding potential biases ([34] Silva and Tenreyro 2006; [35] Santos Silva and Tenreyro 2011). Country-pair fixed effects have been proposed to account for the unobserved endogeneity of trade policy ([36] Baier and Bergstrand 2007). It is worth notingthat the inclusion of exporter-time and importer-time fixed effects will absorb all observable and unobservable time-varying country-specific characteristics that couldaffect the dependent variable, while the country-pair fixedeffects will absorb observable and unobservable bilateral time-invariant characteristics that could affect trade costsbetween the country pair. The inclusion of intra-tradeflows as well as international trade flows is proposed tocorrectly estimate the effects of non-discriminatory tradepolicy, allowing for consumers to choose products fromboth international and domestic sources ([37] Dai, Yotov,and Zylkin 2014; [38] Heid, Larch, and Yotov 2017). Yearintervalsinstead of data pooled over consecutive yearsshould be used to allow for adjustment of trade flowsto policies that might not have immediate effects, as Iexpect TAs effects to behave ([39] Baier and Bergstrand2007; [40] Anderson and Yotov 2016). And finally, toaccount for the effects of globalization forces that maybiased the estimates of trade policies, a set of globalizationdummies are recommended to control for the effects ofglobalization in the gravity model ([41] Yotov 2012; [42]Bergstrand, Larch, and Yotov 2015).

2. Benchmark Model: Based on the theoretical and empirical best-practices found in the relevant literature, I employ the following gravity equation using a PPML estimator and a balanced panel data approach with multiple exporters, multiple importers and time as my benchmark model:

$$X_{ij,t} = \exp\left(\eta_{i,t} + \psi_{j,t} + \gamma_{i,j} + \beta_1 TA_{ij,t} + \beta_2 TA_{ij,t-5} + \sum_t b_t\right) + \epsilon_{ij,t} \quad (1)$$

Where $X_{ij,t}$ denotes the value of exports from an origin country i to a destination country j; $\eta_{i,t}$ and $\psi_{j,t}$ are, respectively, exporter-time and importer-time fixed-effects; $\gamma_{i,j}$ is a country-pair fixed-effect; $TA_{ij,t}$ and $TA_{ij,t-5}$ are my main variables of interest, which, respectively indicate if i and j are members of a TA at time t and, to account for potential "phase-in" effects over time of the TA, at time t − 5; $\sum$ is a set of dummies that equal 1 for international trade and 0 for domestic trade observations at each time t; and $\epsilon_{ij,t}$ is an error term.

3. **TA Heterogeneity Model:** In contrast with my main interest of research, which are the potential heterogenous effects of TAs on different members for different types of agreements, this benchmark model, specifically $\beta = \beta_1+\beta_2$, would provide the average "total" partial effect of TAs on trade, relative to non-TA-members, after accounting for lagged effects, but it cannot provide the effects for a given agreement. As such, an expansion can be implemented to capture heterogeneity in TA effects as proposed by Baier et al. ([43] Baier, Yotov, and Zylkin 2019):

1.

$$X_{ij,t} = exp\left(\eta_{i,t} + \psi_{j,t} + \gamma_{i,j} + \sum_A \beta_{1,A} TA_{ij,t} + \sum_A \beta_{2,A} TA_{ij,t-5} + \sum_t b_t\right) + \varepsilon_{ij,t} \quad (2)$$

Equation (2) can be implemented to account for heterogeneous effects of TAs at the level of the specific agreement, by allowing for distinct average partial effects for each individual agreement, using superscript A to index by agreement and also allowing for agreement-specific lags: $\beta_A = \beta_{1,A} + \beta_{2,A}$.

4. **North-North, North-South and South-South TAs:** In order to analyze the differentiated effects of North- North, North-South and South-South TAs, I extend both models to get estimates for each type of TA. My benchmark model is extended as follows:

$$X_{ij,t} = exp\left(\eta_{i,t} + \mu_{j,t} + \gamma_{i,j} + \beta_{1NN} TA_{NN_{ij,t}} + \beta_{2NN} TA_{NN_{ij,t-5}} + \beta_{1NS} TA_{NS_{ij,t}} + \beta_{2NS} TA_{NS_{ij,t-5}}\right) + \beta_{1SS} TA_{SS_{ij,t}} + \beta_{2SS} TA_{SS_{ij,t-5}} + \sum_t b_t + \varepsilon_{ij,t} \quad (($$

Where $X_{ij,t}$ denotes the value of exports from country ito country j at time t; $\eta_{i,t}$ and $\psi_{j,t}$ are exporter-time andimporter-time fixed effects, respectively; $\gamma_{i,j}$ is a countrypair fixed effect; β_{1NN}

and β_{2NN} are the coefficientsfor the immediate and lagged effects of a North-NorthTA (TA_NN); β_{1NS} and β_{2NS} are the coefficients forthe immediate and lagged effects of a North-South TA(TA_SN); β_{1SS} and β_{2SS} are the coefficients for the immediate and lagged effects of a South-South TA (TA_SS); $\sum$ is a set of time dummies accounting for internationaltrade-specific effects at each time t; and $\epsilon_{ij,t}$ is the errorterm.

Equation (2) also gets extended to capture the heterogeneouseffects of the different types of TAs as follows:

$$X_{ij,t} = exp\left(\eta_{i,t} + \psi_{j,t} + \gamma_{i,j} + \sum_{A}\left(\beta_{1,A,NN}TA_{NN_{ij,t}} + \beta_{2,A,NN}TA_{NN_{ij,t-s}}\right) + \sum_{A}\left(\beta_{1,A,NS}TA_{NS_{ij,t}} + \beta_{2,A,NS}TA_{NS_{ij,t-s}}\right) + \sum_{A}\left(\beta_{1,A,SS}TA_{SS_{ij,t}} + \beta_{2,A,SS}TA_{SS_{ij,t-s}}\right) + \sum_{A} b_t\right) + \varepsilon_{ij,t} \quad (4)$$

Where $X_{ij,t}$ denotes the value of exports from country i to country j at time t; $\eta_{i,t}$ and $\psi_{j,t}$ are exporter-time and importer-time fixed effects, respectively; $\gamma_{i,j}$ is a country-pair fixed effect; The summations $\sum$A denote the sum over different agreements A for: $\beta_{1,A,NN}$ and $\beta_{2,A,NN}$: Coefficients for the immediate and lagged effects of North-North TAs (TA_NN); $\beta_{1,A,NS}$ and $\beta_{2,A,NS}$: Coefficients for the immediate and lagged effects of North- South TAs (TA_SN); $\beta_{1,A,SS}$ and $\beta_{2,A,SS}$: Coefficients for the immediate and lagged effects of South-South TAs (TA_SS); $\sum$ is a set of time dummies accounting for trade-specific effects at each time t; and $\epsilon_{ij,t}$ is the error term.

For both extended models I use the following variables: $TA\_NN_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-North and part of a TA at time t, and 0 otherwise; $TA\_NN_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-North and was part of a TA at time t-5, and 0 otherwise; $TA\_NS_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-South and part of a TA at time t, and 0 otherwise; $TA\_NS_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-South and was part of a TA at time t-5, and 0 otherwise; $TA\_SS_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is South-South and part of a TA at time t, and 0 otherwise; $TA\_SS_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is South-South and was part of a TA at time t-5, and 0 otherwise;

The extended models allow me to capture the differentiated effects of TAs on bilateral exports depending onwhether the pair country are two "North" countries (NN), a "North" and a "South" country (NS), or two "South" countries (SS).

B. Export Product Unit Value

Inspired by other strands of the international trade literature, I also test my models using "Unit Values" of the products exported, by dividing the total value exported by the total Iight exported in kilograms ([44] Latzer and Mayneris 2021; [24] Manova and Zhang 2012;[23] Bastos and Silva 2010). Using the unit value as the dependent variable in my estimations allow me to analyze if the value per unit exported is affected by TAs. To be consistent in my effort to understand the potentially heterogenous effects of TAs according to the different category of the members in trade volume, but also in qualityupgrading and industrialization development of countries, I focus on manufacturing products ([31] Chatzilazarouand Dadakas 2023) with HS 2-digit codes 84 (Nuclear reactorsboilers, machinery and mechanical appliances; parts thereof) and 85 (Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles) which are part of the "Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sour sound recorders and reproducers, and parts and accessories of such articles" category from the World Customs Organization. My aim is to compare the effects of TAs on trade volumes against the effects on the unit value of manufacturing products exported.

C. Defining North and South

Defining which countries belong to the "North" and "South" categories is a key step in order to properly analyze the impact of TAs on different bilateral export relationships. However, it is important to consider that any way in which I categorize countries can be criticized for not taking into consideration the diverse and heterogeneous characteristics of individual countries within each group. Furthermore, especially since my focus is to analyze South- South relationships, it is possible to further disaggregate from the "South" group the emerging economies which are becoming more relevant at the political and economic world stage and are challenging the hegemony of traditional developed economies. The level of disaggregation, as Ill as the level of attention to heterogenous characteristics among and within groups, depends on the research question at hand. For the purposes of this paper, I will not consider such heterogeneity within groups, and just focus on categorizing countries as "North" and "South", but by no means does this assumes that countries are homogenous within groups. This is just a useful distinction to study heterogeneity across TA effects.

One intuitive approach could be to categorize countriesbased on their income level, but this approach wouldneed to deal with a dynamic list of groups, as countries change their category through time. Also, high-income countries include non-industrialized small-nations which I do not expect to generate significant effects on the industrial development as well as technology- and skills- upgrading of trade-partner countries. For such reasons, I have decided to use the same categorization of countries as Dahi & Demir ([25] Dahi and Demir 2017) which takes into consideration characteristics such as incomes, production and trade structures, factor endowments, and human and institutional development to construct a list of "North" and "South" countries, and also keeps the groups consistent over time. This results in 23 countries categorized as "North", and the rest as "South".

D. Data

To construct my dataset I have combined TA data from the "Design of International Trade Agreements" (DESTA) ([45] Dür, Andreas, Leonardo Baccini and Manfred Elsig 2014) and from the CEPII "Trade and Production Database" (TradeProd) ([46] Thierry Mayer, Gianluca Santoni, Vincent Vicard 2023). The DESTA database aims to aggregate all agreements that have the potential to liberalize trade, including all agreements notified to the World Trade Organization (WTO) and other agreements from a wide range of sources, covering 880 agreements for 204 countries since 1948 to 2023 in the last updated version.

My sample consists of TAs signed between the years 2000 to 2010 and the country members to these TAs, totaling 154 agreements and 143 member countries. For ease of estimation, and to get a sense of geographical differences, I estimate my models by TA region for five main regions: Africa, Americas, Asia, Europe and Intercontinental (I exclude Oceania [11 countries and1 agreement] for lack of sufficient trade data for my estimations). Each region has the following samples of agreements and countries: Intercontinental (114 countries and 64 agreements), Europe (42 countries and 41 agreements), Asia (35 countries and 33 agreements), Americas (15 countries and 13 agreements) and Africa (10 countries and 2 agreements).

For all countries in my sample, I get international trade and domestic trade flows from the TradeProd database, which has been created specifically for estimating gravity models and combines trade data from the UN Commodity Trade Statistics Database (COMTRADE) and production data from UNIDO Industrial Statistics database (INDSTAT). I also download export data directly from COMTRADE for all countries in my sample to construct my export product unit value measurements. For estimations on trade flows, I use international tradeflow data as reported by importer. In order to measure the appropriate lags for the effects of each agreement, my period of interest for international flow data is between 1995 to 2015, and since I are estimating in 5-year intervals, I get trade flow data for the years 1995, 2000, 2005, 2010 and 2015. Finally, as mentioned before, export product unit values are constructed using the total value exported per product per year divided by the net Iight exported of said product for said year at the HS 2-digit code level for the 84 and 85 codes for manufacturing products. As it is not possible to get data for product unit values for domestic trade, the estimations using this measure as the dependent variable will suffer from bias as the estimation does not include intra-trade effects. However, the direction of bias is important as not including intra-trade measures is expected to bias the effects of TAs downwards ([29] Yotov et al. 2016), so I use this estimates as illustrative conservative measurements of the effects of TAs on the unit value of exported products.

IV. FINDINGS

This section presents and describes the results of estimating my gravity models.

A.Benchmark Results

I begin by briefly discussing the results of my benchmark estimation by region, contained in Table 1. I immediately see that the average total or "cumulative" effects of TAs on trade flows,

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relative to non-TA-members, after accounting for phase-in effects (the sum of the current and lagged TA estimates), is heterogenous across regions. Only Americas, Europe and Intercontinental TAs have statistically significant results, with all coefficients being positive and generally similar to the results I would expect according to the literature. The smallest effect, that of Intercontinental TAs, has a statistically significant coefficient at the 5% of 0.203 with a standard error of (0.106). I interpret this coefficient as Intercontinental TAs having an average a partial effect of (exp(0.203)-1)x100%. = 22.5% increase in trade flows. The largesteffect, that of Europe's TAs, has a statistically significant coefficient at the 1% of 0.475 with a standard error of (0.025). I interpret this coefficient as Europe's TAs having an average a partial effect of (exp(0.475)-1)x100%.= 60.8% increase in trade flows. On the other hand, Africa and Asia does not have statistically significant results, with Asia's coefficient taking a negative value. Interestingly, Africa's TA coefficient is highly significant and positive, and TA Lag is not significant and negative, while Asia's TA coefficient is not significant and positive, and TA Lag is highly significant and negative.

B. TA Heterogeneity Results

The results of my model allowing for heterogenous effects of TAs is shown in Tables 1 through Table 13. Again, I can observe significant heterogeneity across regions and TAs.

TABLE I
Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
	Variables				
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
TA	0.578***	0.287***	0.064	0.237***	0.015
	(0.154)	(0.071)	(0.083)	(0.019)	(0.093)
TALag	-0.278	0.146	-0.167***	0.238***	0.188***
	(0.300)	(0.149)	(0.056)	(0.022)	(0.043)
TA+TALag	0.301	0.433***	-0.103	0.475***	0.203*
	(0.295)	(0.140)	(0.094)	(0.025)	(0.106)
Exporter-YearFE	Yes	Yes	Yes	Yes	Yes
Importer-YearFE	Yes	Yes	Yes	Yes	Yes
Country-PairFE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.999	0.999	0.997	0.998
Observations	5838	10997	25308	28168	73930

Notes: Robust standard errors clustered at the country-pair in parentheses. Significance levels are indicated as follows: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01.

Americas has ten TAs with statistically significant and positive coefficients, two with no statistically significant effect, and one TA with a statistically significant and negative coefficient.

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Asia has eight TAs with statistically significant and positive coefficients, nine with no statistically significant effect, and four TAs with statistically significant and negative coefficients. Europe has eighteen TAs with statistically significant and positive coefficients, nine with no statistically significant effect, and one TA with a statistically significant and negative coefficient. And finally, Intercontinental has twenty-eight TAs with statistically significant and positive coefficients, twenty with no statistically significant effect, and six TAs with statistically significant and negative coefficients. Across the regions, 64 out of 118 (54.24%) coefficients have significant and positive effects, 42 out of 118 (35.59%) have no significant effects, and 12 out of 118 (10.17%) have significant and negative effects. A summary of the findings can be found on Figure 5, with the significance of the coefficients on the Y axis (all non- significant coefficients assigned a value of -1 for ease of visualization, and significant coefficients assigned a value of 1, 2 or 3 according to their significance, with the highest significance being 3) magnitude of the coefficients on the X axis, showing negative and positive coefficients.

C.North-North, North-South and South-South Tas

1.North-South Benchmark Results: I present the results of my extended models allowing me to capture the differentiated effects of TAs on bilateral exports depending on whether the country pair are two "North" countries (NN), a "North" and a "South" country (NS), or two "South" countries (SS).

The results of the extended benchmark estimation by region, contained in Table 2 again show heterogenous results across regions. It is interesting to note that by disaggregating

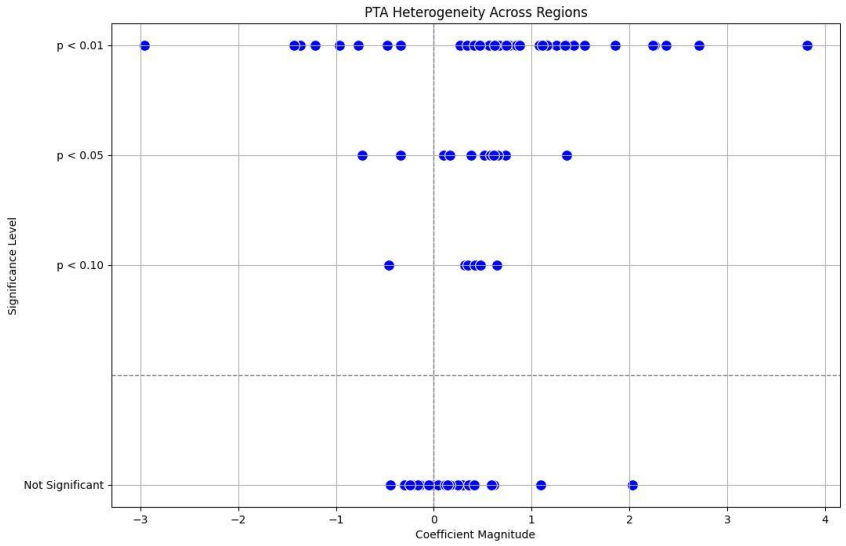

Fig. 5. TA Heterogeneity Across Regions

the TA effects, in the case of Americas and Europe, both of which had significant and positive coefficients in the benchmark estimation, now again have significant and positive coefficients for

both NS TA + Lag and SS TA + Lag , but the effects are larger in both cases for the SS TA + Lag coefficient. Asia now has a slightly significant and negative coefficient for NS TA + Lag while the coefficient for SS TA + Lag remains not significant. Intercontinental have significant and positive effects of NS Lag and SS Lag, but NS TA + Lag and SS TA + Lag are both not significant now. Africa's coefficients remain not significant, and it is the only region with only South-South TAs.

2.North-South TA Heterogeneity Results: The results of my extended model allowing for heterogenous effects of TAs. Africa only has effects for South- South TAs and again has no statistically significant effect for any TA. Americas has five TAs with North- South estimates, one of which has statistically significantand negative effects for NS TA + Lag and statistically

TABLE II
Regional Results by TA Type

Variables	(1)	(2)	(3)	(4)	(5)
	Africa	Americas	Asia	Europe	Intercontinental
NNTA				0.207***	0.013
				(0.021)	(0.072)
NNTA Lag				0.192***	0.016
				(0.023)	(0.073)
NNTA+NNTALag				0.399***	0.029
				(0.026)	(0.102)
NSTA		0.199***	-0.089	0.374***	0.013
		(0.069)	(0.089)	(0.041)	(0.144)
NSTALag		0.234	-0.067	0.349***	0.231***
		(0.190)	(0.060)	(0.041)	(0.061)
NSTA+NSTALag		0.434**	-0.156*	0.723***	0.244
		(0.200)	(0.090)	(0.046)	(0.156)
SSTA	0.578***	0.476***	0.153	0.530***	0.004
	(0.154)	(0.139)	(0.117)	(0.107)	(0.121)
SSTALag	-0.278	-0.023	-0.208***	0.575***	0.204***
	(0.300)	(0.133)	(0.063)	(0.119)	(0.073)
SSTA+SSTALag	0.301	0.453***	-0.055	1.105***	0.208
	(0.295)	(0.112)	(0.130)	(0.092)	(0.128)
Exporter-YearFE	Yes	Yes	Yes	Yes	Yes
Importer-YearFE	Yes	Yes	Yes	Yes	Yes
Country-PairFE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.999	0.999	0.997	0.998
Observations	5838	10997	25308	28168	73930

Notes: Robust standard errors clustered at the country-pair level in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

significant and positive effects for SS TA + Lag. Of the remaining four, none have estimates for SS TA + Lag, three are statistically significant and positive, and one is not statistically significant. It has eight TAs with South-South estimates, seven of which have statistically significant and positive effects, while one does not have statistically significant effects. Americas does not have any coefficients for North-North. Asia has two TAs with North- South estimates, one of which is statistically significant and positive, while the other is not statistically significant. It has nineteen TAs with South-South estimates, seven of which have statistically significant and positive effects, four have statistically significant and negative coefficients, and eight does not have statistically significant effects. Asia does not have any coefficients for North-North. Europe has eight TA North-South estimates, five of which are statistically significant and positive, and the others are not statistically significant. One of the five agreements with statistically significant and positive coefficients for NS TA + Lag also has a statistically significant and positive coefficient for SS TA + Lag. None of the other agreements with a NS coefficient have statistically significant coefficients for SS. It has nineteenSouth-South estimates, thirteen are statistically significant and positive, one is statistically significant and negative, and five are not significant. Finally, the region has one agreement with a North-North estimate, which also has a North-South and a South-South estimate and they are all statistically significant and positive. Intercontinental has thirty TA North-South estimates, of which twelve are statistically significant and positive, fifteen are not statistically significant, and three are statistically significant and negative for NS TA + Lag. None of these TAs also have coefficients for SS TA + Lag of which five are statistically significant and positive, three are not statistically significant, and one is statistically significant and negative. It has tInty-one estimates for South-South, of which fourteen are statistically significant and positive, five are not statistically significant, and two are statistically significant and negative. It has three agreements with North-North estimates, two statistically significant and positive, and one are not statistically significant. Across the regions and TAs, 23 out of 47 (48.94%) NS coefficients have significant and positive effects, 20 out of 47 (42.55%) NS coefficients have no significant effects, and 4 out of 47 (8.51%) NS coefficients have significand and negative effects; 49 out of 84 (58.33%) SS coefficientshave significant and positive effects, 27 out of 84 (32.14%) SS coefficients have no significant effects, and 8 out of 84 (9.52%) SS coefficients have significant and negative effects; and, 3 out of 4 (75%) NN coefficients have significant and positive effects, 1 out of 4 (25%) NN coefficients have no significant effects, and none have significant and negative effects. A summary of the findings can be found on Figure 6 for North-South trade, Figure 7 for North- North trade and Figure 8 for South-South trade, with the significance of the coefficients on the Y axis (all non-significant coefficients assigned a value of -1 for ease of visualization, and significant coefficients assigned a value of 1, 2 or 3 according to their significance, with the highest significance being 3) magnitude of the coefficients on the X axis, showing negative and positive coefficients.

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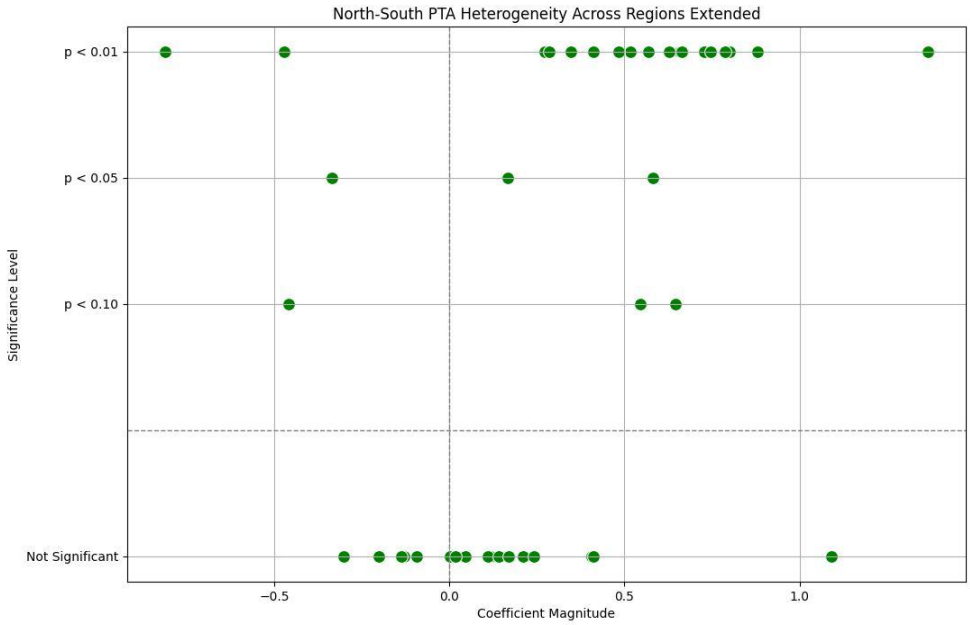

Fig. 6. North-South TA Heterogeneity Across Regions Extended

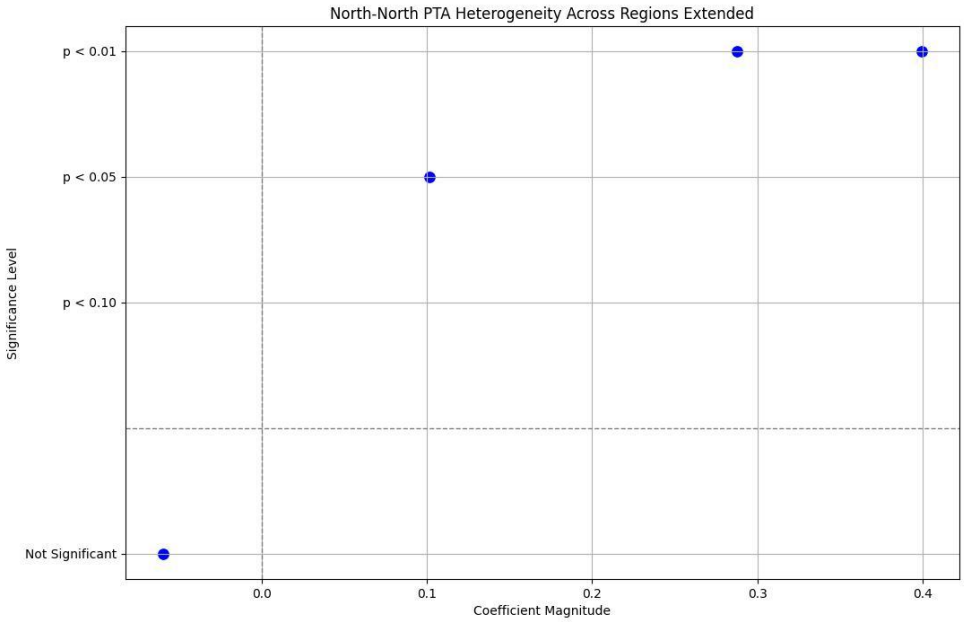

Fig. 7. North-North TA Heterogeneity Across Regions Extended

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a. Export Product Unit Value Results

Finally, I present the results of running my estimations substituting trade flows as my dependent variable for the unit values of products exported, specifically under the HS 2-digit codes 84 and 85 for manufacturing products, in order to analyze if the effect of TAs goes beyond trade volumes. For ease of comparison, I ran each estimationtwice for each HS code: one with trade volume as the dependent variable, and one with the unit value of the product exported as the dependent variable.

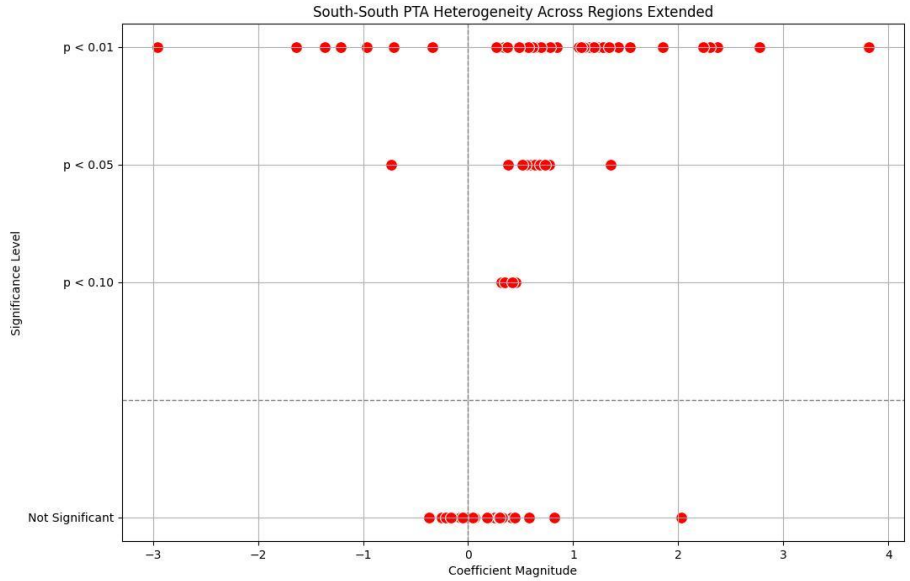

Fig. 8. South-South TA Heterogeneity Across Regions Extended

Tables 3 and 4, and 5 and 6, show the results of my benchmark model for each region for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. I continue to observe heterogeneous results across regions. In table 3, for the trade volume of HS 84, none of the TA + Lag coefficients are statistically significant with the exception of the Intercontinental region, for which it is statistically significant and negative. In table 4, for the unit value of the product exported of HS 84, the effects are not significant for Africa and Asia, they are significant and negative for Americas, and significant and positive for Europe and Intercontinental. Interestingly, these results suggest that Intercontinental TAs reduced the volume of trade of HS 84 products but increased the value per unit. In table 5, for the trade volume of HS 85, TA + Lag coefficients are not statistically significant for Americas, Asia and Intercontinental, while Africa's results are significant and positive, and Europe's are significant and negative. In table 6, for the unit value of the product exported of HS 85, results are only

slightly significant for Intercontinental, with a negative coefficient. The rest of the regions do not have significant results.

Tables 7 and 8, and 9 and 10, show the results of my extended benchmark model with North-North, North-South and South-South TAs, for each region for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. In table 7, for the trade volume of HS 84, I observe that for North-North trade, TA + Lag coefficient for Intercontinental has a significant and positive coefficient, while Europe's is not significant. For North-South trade TA + Lag coefficients are not significant for Asia and Europe, while they are significant and positive for Americas, and significant and negative for Intercontinental. For South-South trade, TA+ Lag for Africa, Asia and Europe do not have significantcoefficients, while the coefficients of Americas and Intercontinental are significant and negative. In table 8, for the unit value of the product exported of HS 84, for North- North trade's TA + Lag, Europe's coefficient is significant and positive and the coefficient of Intercontinental is not significant. For North-South trade, none of the TA + Lag coefficients are significant. For South-South trade, the TA + Lag coefficients of Africa, Americas and Asia are not significant, while Europe and Intercontinental have significant and positive coefficients. Interestingly, while trade volume for North-South and South-South for Inter- continental TAs decreased, the value per unit of South- South trade increased. In table 9, for the trade volume of HS 85, I observe that for North-North trade, TA+ Lag coefficient for Intercontinental has a significantand positive coefficient, while Europe's is not significant. For North-South trade TA + Lag coefficients are not significant for Americas, Asia and Intercontinental, while they are significant and negative for Europe. For South- South trade, TA + Lag for Americas, Asia, Europe and Intercontinental do not have significant coefficients, while the coefficient of Africa is significant and positive. In table 10, for the unit value of the product exported of HS 85, for North-North trade's TA + Lag, Europe and Intercontinental coefficients are not significant. For North- South trade, the TA + Lag coefficients for Americas and Europe are not significant, while they are significant and negative for Asia and Intercontinental. For South-South trade, the TA + Lag coefficients of Africa, Americas and Intercontinental are not significant, while Europe has significant and negative coefficients and Asia has significant and positive coefficients. Interestingly, for Asia's exports, the value per unit of product exported decreased with North-South trade but increased with South-South trade. Finally, for illustrative purposed, in tables 11 and 12, and 13, I include the estimates of my model allowing for TA specific effects, extended with North- North, North-South and South-South TAs, for Africa and Americas, for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. In table 11, for the trade volumes of HS 84 and 85 for Africa, which only has South-South TAs, I can see that TA 670 had statistically significant and negative effects on the trade volume of HS 84, and not significant for HS 85. TA 787 did not have a significant impact on trade volume of HS 84, while it has significant and positive effects on HS 85. In table 12, for the unit value of products HS 84 and 85 exported for the region of Africa, I can see that TA 670 did not have significant effects on the value per unit of products in HS 84 and 85. TA 787 did not have a significant impact on the value per unit of HS 84, while it has significant and positive effects on HS 85. This is a case where I can see a that a TA has a significant effect on the volume of trade

and in the value per unit of a category of manufacturing products of a South-Southtrade relationship.

In table 13, for the trade volumes of HS 84 and 85, for the unit value of products HS 84 and 85, all for the region of Americas, which has North-South and South-South TAs, I can observe heterogeneous effects of different TAs on the different types of bilateral trade relationships. One interesting example is TA 188, which has North-South and South-South trade among its members. It has positive and significant effects in the trade volumes of HS 84 and 85 for South-South trade, while it has no significant effect in the trade volume of HS 84 and 85 for North-South trade. Furthermore, it has a significant and negative effects on the value per unit of HS 84 for both North-South and South-South trade, and it has no significant effect on the value per unit of HS 85 for both North-South and South-South trade.

V. ANALYSIS AND DISCUSSION

My analysis finds evidence of positive, negative and not significant effects of TAs on both South-South and North-South trade relationships, on trade volumes and on the value per unit of manufacturing products exported, relative to trade with non-members. The magnitudes of my findings are similar to the estimates in the empirical literature on the effects of TAs on trade. My findings on the heterogeneous of effects of TAs appear to indicate that TAs can have positive and negative effects on North-South and South-South bilateral trade relationships, and that declaring them as stumbling or building blocks of industrial development and growth is not straight forward.

A. Potential Determinant Mechanisms of Heterogeneous Effects of TAs

Some potential determinant mechanisms of the effects of TAs in the academic literature are related to the content of the TA, and the extent to which it removes trade barriers. TAs should have more potential for larger effects when they remove trade frictions imposed by other trade policies and regulations, domestic or foreign ([43] Baier et al., 2019). Moreover, unilateral trade policies can create a terms-of-trade inefficiency externality when a government introduces a higher trade barrier, shifting the cost to foreign exporters ([47] BagIll & Staiger, 1999). Since foreign exporters bear the cost of the inefficiency, there is a tendency by governments to set barriers at a higher level than it would be politically efficient. TAs can act as a mechanism to remove or lower said inefficiencies, resulting in better trade and Welfare outcomes, or in an observed higher effect of a TA relative to non-members in my case. Through trade diversion, there is a theoretical possibility that the proliferation of TAs can harm the terms of trade of non-TA-members and create significant inefficiencies in the world trading system ([48] Anderson & Yotov, 2016), but empirical evidence so far finds that TAs negligibly harm non-members and global efficiency rises.

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TABLE III
HS 84 Trade Volume Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
TA	-0.364	-0.289*	-0.005	0.288**	-0.411***
	(0.695)	(0.162)	(0.078)	(0.146)	(0.099)
TALag	-0.247	-0.024	-0.053	-0.233*	-0.081
	(0.403)	(0.120)	(0.048)	(0.122)	(0.077)
TA+TALag	-0.610	-0.313	-0.057	0.056	-0.491***
	(0.676)	(0.201)	(0.080)	(0.165)	(0.126)
Exporter-YearFE	Yes	Yes	Yes	Yes	Yes
Importer-YearFE	Yes	Yes	Yes	Yes	Yes
Country-PairFE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.997	0.992	0.986	0.989
Observations	1314	4230	10778	18152	36735

Notes: Robust standard errors clustered at the country-pairlevelinparentheses.Significancelevelsareindicatedasfollows:*p<0.1;**p<0.05;***p<0.01.

Another strand of the relevant literature emphasizes the extensive margin of trade ex-ante the signature of a TA as an important determinant of its effects. In particular, that TAs has an important effect in the growth of the extensive margin of trade, which in turn is a significant factor in the overall growth of total trade ([49] Kehoe & Ruhl, 2013). If a TA is signed between country members with low diversity of traded goods, it is expected that I will see a bigger effects of the TA in trade growth driven by the increase in the number of goods traded and in the volume of trade of the least-traded products ([50] Kehoe et al., 2015). Interestingly, empirical research shows that the number of products exported ex-ante is positively related to the trade creation after a TA, but when heterogeneous effects of TAs within agreements and country-pairs is taken into consideration, the extensive margin of trade does account for differences in trade creation ([43] Baier et al., 2019).

There is also evidence that different types of agreements, such as non-reciprocal preferential trade agreements (NRPTAs), preferential trade agreements (PTAs), free trade agreements (FTA), customs unions (CU), common markets (CMs) and economic unions (EUs), can have different levels and time horizons of trade effects ([51] Baier et al., 2014; [52] Magee, 2008). This can occur because different types of TAs can induce different unobservable effects that reduce trade costs, as I observe that modern TAs not only reduce tariffs, but also regulate all kinds of non-tariff issues in what is called "deep integration" ([48] Anderson & Yotov, 2016). The deeper the integration, the more effective I expect TAs to be ([19] Kohl, 2014). It has also been shown that the design of TAs matters, in terms of institutional design and legal enforceability, with more

comprehensive agreements being better at stimulating positive trade outcomes ([53] Kohl et al., 2013).

TABLE IV
HS 84 Trade Volume Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
TA	-0.364	-0.289*	-0.005	0.288**	-0.411***
	(0.695)	(0.162)	(0.078)	(0.146)	(0.099)
TA Lag	-0.247	-0.024	-0.053	-0.233*	-0.081
	(0.403)	(0.120)	(0.048)	(0.122)	(0.077)
TA + TA Lag	-0.610	-0.313	-0.057	0.056	-0.491***
	(0.676)	(0.201)	(0.080)	(0.165)	(0.126)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.997	0.992	0.986	0.989
Observations	1314	4230	10778	18152	36735

Notes: Robust standard errors clustered at the country-pair level in parentheses.
Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

The differences in market power across member countries could also be important, as countries with less market power relative to other TA members over their terms of trade are expected to grant smaller concessions when they negotiate agreements. Agreements between countries with relatively similar market power over each other's term of trade potentially have higher potential to eliminate inefficiencies and achieve higher effects ([43] Baier et al., 2019).

Based on the academic arguments mentioned, can I expect that TAs will have more potential for effectively improve trade outcomes when the bilateral relationship is South-South vs North-South? It would appear that it depends highly on the terms of trade inefficiencies and the potential for increases in the extensive margin of trade ex-ante the agreement is in place, as well as in the design and depth of the agreement. These are considerations that should be taken on a bilateral case-by-case basis, rather than in an aggregated matter. Moreover, as more South- South TAs are signed, and more of the share of global trade happens among South countries, the North-South distinction also starts to lose relevance. Evidence appears to show that the "South" is splitting into groups, with the "Emerging South" growing at an accelerated pace and even challenging the hegemony that developed economies have enjoyed since the Post-World War II period.

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TABLE V
HS 85 EPUV Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
TA	2.098**(1.032)	-0.360(0.583)	0.965***(0.324)	-0.198(0.278)	-0.010 (0.190)
TA Lag	-0.478 (0.650)	0.421 (0.408)	-0.299 (0.294)	-0.184 (0.247)	- 0.280 (0.208)
TA + TA Lag	1.620 (1.150)	0.062 (0.524)	0.666 (0.494)	-0.382 (0.333)	-0.290* (0.175)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.939	0.990	0.992	0.950	0.956
Observations	1130	3698	9934	16235	33070

Notes: Robust standard errors clustered at the country-pair in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

It could be the case that the same power dynamics observed between developed and developing countries by the classical development literature can also occur in South-South relationships, and that they can become a threat for the development of the least-developed economies in the South ([25] Dahi & Demir, 2017). It is clear that more research focused on South-South dynamics is needed in order to guide the policy decisions of different groups of countries. It appears clear from the literature studied and from the empirical analysis carried out in this paper, that TAs have significant potential and that they can be an effective development policy tool for South countries based on their dynamic effects on the structure of production capacity, as long as a proper analysis of current capabilities and identification of related products and industries is carried out. South countries should strive to acquire new capabilities close-by in relatedness to the capabilities already in place and choose appropriate partner countries to do so. For more immediate concerns of trade creation and trade diversion, it should be taken into consideration low traded and non-traded products between potential partners to increase the chances of trade creation, as Well as striving for deep integration in the design of the agreement as much as possible.

B. Limitations

Although the predictive power of the Gravity Model of Trade is Well established in the relevant literature, and I have done my best to follow the best practices to avoid endogeneity and biases when studying the effects of preferential agreements on international trade, it is important to note that my empirical analysis does not claim to achieve a causal inference on the effects of TAs. There could be other policies and forces driving the effects described in my estimates. Also, since the period studied comprehends the global financial crisis of 2007-2008, it is possible that

running the same models for other periods of time could find different results. My estimates could also be constrained by the quality of the data and reporting or measurement error in trade flows, particularly in South countries without robust institutional capacity and statistical infrastructure. By using relatively modern data I hope to mitigate this concern, but I acknowledge that the data of the first half of my period studied (1995-2005) might be less accurate than the later period (2005-2015). Still, this research provides useful insights, even if they are just illustrative, on the heterogeneous effects of TAs, and their development potential and use by developing countries.

VI. CONCLUSION

This paper empirically analyzed the effects of TAs on the volume of trade of exports and on the value per unit of manufacturing products exported of member-countries to agreements signed between the years 2000 and 2015,with an ample dataset comprised of 154 agreementsand143 countries, using a gravity model of trade, updated with the best practices in the literature, and subsequent extensions to capture the heterogeneous effects of TAs on its members, and on their disaggregated bilateral trade relationships classified as North-North, North-South and South-South, relative to non-TA-members. I found coefficient magnitudes consistent with the empirical literature and high degrees of heterogeneity on the effects of TAs, and no conclusive answer to the research questions of whether South-South TAs act as building blocks or stumbling blocks to developing countries, or if they are preferable to North-South agreements. I proposed some potential mechanisms driving the heterogeneity of the effects of TAs, and also cautioned against threating the "South" as a homogeneous group.

In this paper I have proposed several methodological innovations to advance the literature on the effects of TAs. I use a modern data set, comprised of data between the years 1995 and 2015, with data on both international and domestic trade. I do not focus my sample on particular regions or groups of countries, nor on specificagreements. I try to cover as many countries and TAs as possible, without over representation of developed or "North" countries or of the biggest agreements. I extend traditional gravity estimations to capture heterogenous effects of TAs instead of the average "total" partial effect as is common in the literature, as well as heterogenous effects of TAs on the different categories of bilateral trade relationships (North-North, North-South and South- South). Finally, I complement my main estimations by replacing bilateral trade volume with the export product unit value of manufacturing products (HS codes 84 and 85).

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TABLE VI
HS 84 Trade Volume Regional Results by TA Type

	(1)	(2)	(3)	(4)	(5)
Variables					
	Africa	Americas	Asia	Europe	Intercontinental
NN TA				-0.087	0.084
				(0.163)	(0.080)
NN TA Lag				-0.234	0.187*
				(0.191)	(0.098)
NN TA + NN TA Lag				-0.321	0.272**
				(0.233)	(0.121)
NS TA		-0.082	-0.001	0.236*	-0.455***
		(0.108)	(0.096)	(0.133)	(0.104)
NS TA Lag		0.294*	-0.079	-0.242*	-0.126
		(0.151)	(0.059)	(0.139)	(0.093)
NS TA + NS TA Lag		0.212**	-0.080	-0.006	-0.580***
		(0.097)	(0.112)	(0.169)	(0.111)
SS TA	-0.364	-0.310*	-0.006	0.417*	-0.315***
	(0.695)	(0.189)	(0.117)	(0.215)	(0.102)
SS TA Lag	-0.247	-0.123	-0.037	-0.129	0.057
	(0.403)	(0.112)	(0.080)	(0.160)	(0.082)
SS TA + SS TA Lag	-0.610	-0.433*	-0.043	0.287	-0.258**
	(0.676)	(0.229)	(0.126)	(0.228)	(0.125)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.997	0.992	0.986	0.989
Observations	1314	4230	10778	18152	36735

Notes: Robust standard errors clustered at the country-pair level in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

Future research on the heterogenous effects of TAs using gravity models is promising, as the empirical methods continue to improve, and they are applied to get more detailed and nuanced estimates that can better guide thedevelopmental decisions and policies of developing countries. Some potential areas for future research on "South" countries include research on the dynamic effects of Tas on the industrialization process and on technology absorption and upgrading; extending gravity models to capture effects of country-pairs member to a TA, and to capture effects on individual countries of a country-pair member to a TA ([43] Baier et al., 2019); extending the gravity model tocapture effects of different types of TAs depending on their depth and content; different sub-classifications of "South" countries should be explored to further understand the limits to South-South cooperation in trade; and, beyond trade volume, the

measure of export product unit value can be used to capture the increase or decrease of the value per unit commodities and goods in specific industries.

TABLE VII
HS 84 EPUV Regional Results by TA Type

	(1)	(2)	(3)	(4)	(5)
Variables					
	Africa	Americas	Asia	Europe	Intercontinental
NN TA				0.316	0.584
				(0.258)	(0.516)
NN TA Lag				0.250	-0.740**
				(0.226)	(0.296)
NN TA + NN TA Lag				0.566**	-0.155
				(0.266)	(0.362)
NS TA		1.033**	0.403	0.202	-0.345**
		(0.471)	(0.278)	(0.236)	(0.166)
NS TA Lag		-1.925***	-0.005	0.139	0.576***
		(0.609)	(0.244)	(0.202)	(0.180)
NS TA + NS TA Lag		-0.891	0.399	0.341	0.231
		(0.601)	(0.268)	(0.227)	(0.170)
SS TA	1.676***	-0.974***	-0.004	0.097	-0.063
	(0.592)	(0.324)	(0.195)	(0.265)	(0.231)
SS TA Lag	-2.388***	0.603*	-0.148	0.327	0.542**
	(0.517)	(0.311)	(0.149)	(0.232)	(0.234)
SS TA + SS TA Lag	-0.712	-0.371	-0.152	0.424*	0.479**
	(0.492)	(0.368)	(0.233)	(0.253)	(0.196)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.960	0.986	0.982	0.956	0.966
Observations	1299	4053	10223	18019	35947

Notes: Robust standard errors clustered at the country-pair level in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

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TABLE VIII

HS 85 Trade Volume Regional Results by TA Type

	(1)	(2)	(3)	(4)	(5)
Variables					
	Africa	Americas	Asia	Europe	Intercontinental
NN TA				0.041	0.272**
				(0.208)	(0.128)
NN TA Lag				-0.160	0.271
				(0.208)	(0.190)
NN TA + NN TA Lag				-0.119	0.543**
				(0.246)	(0.274)
NS TA		-0.494	0.158*	-0.051	0.154*
		(0.345)	(0.085)	(0.152)	(0.084)
NS TA Lag		0.700***	-0.038	-0.315**	-0.248**
		(0.270)	(0.094)	(0.153)	(0.108)
NS TA + NS TA Lag		0.206	0.121	-0.366**	-0.094
		(0.442)	(0.120)	(0.174)	(0.091)
SS TA	0.023	0.082	0.118	-0.004	0.039
	(0.419)	(0.206)	(0.128)	(0.211)	(0.152)
SS TA Lag	1.009**	-0.176	-0.088	-0.142	-0.090
	(0.441)	(0.168)	(0.081)	(0.157)	(0.176)
SS TA + SS TA Lag	1.033**	-0.094	0.030	-0.146	-0.051
	(0.404)	(0.280)	(0.160)	(0.196)	(0.194)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.989	0.998	0.993	0.980	0.989
Observations	1205	3836	10465	16436	33999

Notes: Robust standard errors clustered at the country-pair level in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

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TABLE IX
HS 85 EPUV Regional Results by TA Type

	(1)	(2)	(3)	(4)	(5)
Variables					
	Africa	Americas	Asia	Europe	Intercontinental
NN TA				0.024	0.867*
				(0.349)	(0.494)
NN TA Lag				0.409	-0.847**
				(0.292)	(0.411)
NN TA + NN TA Lag				0.433	0.020
				(0.364)	(0.490)
NS TA		-0.582	0.076	-0.244	-0.133
		(1.139)	(0.388)	(0.332)	(0.198)
NS TA Lag		0.918	-1.017***	0.084	-0.200
		(0.629)	(0.370)	(0.245)	(0.232)
NS TA + NS TA Lag		0.336	-0.941**	-0.160	-0.333*
		(0.851)	(0.407)	(0.356)	(0.199)
SS TA	2.098**	-0.208	1.662***	-0.218	0.097
	(1.032)	(0.517)	(0.481)	(0.369)	(0.301)
SS TA Lag	-0.478	0.068	0.026	-0.672**	-0.316
	(0.650)	(0.493)	(0.328)	(0.336)	(0.298)
SS TA + SS TA Lag	1.620	-0.139	1.688**	-0.890**	-0.219
	(1.150)	(0.689)	(0.679)	(0.414)	(0.250)
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.939	0.990	0.992	0.951	0.956
Observations	1130	3698	9934	16235	33070

Notes: Robust standard errors clustered at the country-pair level in parentheses.
Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

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TABLE X

Africa TA + TA Lag Coefficients by Type for Trade Volume of HS 84 and HS 85

TA ID	NS TA+Lag	HS 85 SS TA+Lag	NN TA+Lag	NS TA+Lag	HS 84 SS TA+Lag	NN TA+Lag
NS and SS (or only NS)						
No agreements in this category						
Only SS						
670		-2.234***			-0.041	
		(0.678)			(1.008)	
787		-0.682			1.507***	
		(0.781)			(0.573)	
Agreements with NN and NS						
No agreements in this category						
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.997	0.997	0.989	0.989	0.989
Observations	1314	1314	1314	1205	1205	1205

Notes: Robust standard errors clustered at the country-pair level in parentheses.
Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

TABLE XI

Africa TA + TA Lag Coefficients by Type for EPUV of HS 84 and HS 85

TA ID	NS TA+Lag	HS 85 SS TA+Lag	NN TA+Lag	NS TA+Lag	HS 84 SS TA+Lag	NN TA+Lag
NS and SS (or only NS)						
No agreements in this category						
Only SS						
670		-0.975			-0.860	
		(0.802)			(1.031)	
787		-0.693			2.760***	
		(0.590)			(1.148)	
Agreements with NN and NS						
No agreements in this category						
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.960	0.960	0.960	0.939	0.939	0.939
Observations	1299	1299	1299	1130	1130	1130

Notes: Robust standard errors clustered at the country-pair level in parentheses.
Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

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TABLE XII

Americas TA + TA Lag Coefficients by Type for Trade Volume of HS 84 and HS 85

TA ID	NS TA+Lag	HS 85 SS TA+Lag	NN TA+Lag	NS TA+Lag	HS 84 SS TA+Lag	NN TA+Lag
NS and SS (or only NS)						
188	0.056	3.233***		0.483	1.123***	
	(0.769)	(0.566)		(0.440)	(0.223)	
163	0.579***			-0.095		
	(0.151)			(0.641)		
168	0.191**			-0.514		
	(0.077)			(0.334)		
218	0.401***			1.765***		
	(0.124)			(0.331)		
645	0.296**			-1.341***		
	(0.148)			(0.425)		
Only SS						
141		-0.705*			-0.613	
		(0.372)			(0.388)	
213		0.326			1.233***	
		(0.397)			(0.253)	
239		-0.030			0.008	
		(0.271)			(0.374)	
616		-0.019			-0.416***	
		(0.218)			(0.146)	
201		0.479**			0.971***	
		(0.213)			(0.257)	
716		0.270*			-0.349	
		(0.141)			(0.391)	
612		-0.704***			1.089***	
		(0.180)			(0.276)	
185		0.238			-1.303***	
		(0.399)			(0.278)	
Agreements with NN and NS						
No agreements in this category						
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.997	0.997	0.997	0.998	0.998	0.998
Observations	4230	4230	4230	3836	3836	3836

Notes: Robust standard errors clustered at the country-pair level in parentheses.
Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

TABLE XIII

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Americas TA + TA Lag Coefficients by Type for EPUV of HS 84 and HS 85

TA ID	NS TA+Lag	HS 85 SS TA+Lag	NN TA+Lag	NS TA+Lag	HS 84 SS TA+Lag	NN TA+Lag
NS and SS (or only NS)						
188	-3.217***	-2.778***		-0.568	0.797	
	(0.748)	-1.013		(0.641)	(0.606)	
163	-1.314*			1.272*		
	(0.704)			(0.715)		
168	1.236***			1.189		
	(0.424)			(1.497)		
218	-3.916***			1.103		
	(0.716)			(0.822)		
645	-0.791			-1.662**		
	(0.885)			(0.658)		
Only SS						
141		-0.854**			0.662	
		(0.375)			(0.582)	
213		-0.506			1.089	
		(0.456)			(0.728)	
239		1.263			1.457	
		(0.866)			(0.895)	
616		-0.638			0.728	
		(0.435)			(0.636)	
201		-0.554			1.581***	
		(0.610)			(0.390)	
716		-0.572			2.042	
		(1.223)			(1.478)	
612		-0.015			-2.843***	
		(0.274)			(1.045)	
185		1.023			0.768	
		(0.784)			(1.005)	
Agreements with NN and NS						
No agreements in this category						
Exporter-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.986	0.986	0.986	0.99	0.99	0.99
Observations	4053	4053	4053	3698	3698	3698

Notes: Robust standard errors clustered at the country-pair level in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

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