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Candidate Number: 23802

MSc in Development Management 2023

(Applied Development Economics Specialism)

Dissertation submitted in partial fulfilment of the requirements of the degree.

Title title title

Word Count: 7182

Abstract

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Contents

Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
CPU	Central Processing Unit
GPU	Graphics Processing Unit
IoT	Internet of Things
ML	Machine Learning
NLP	Natural Language Processing
RAM	Random Access Memory
UI	User Interface
UX	User Experience

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1 Introduction

This is the introduction

Stylised facts

Ideas:

Total number of SS, NS and NN PTAs

Share of SS, NS and NN PTAs

Total exports by S and N countries

Share of total exports by S and N countries

Total exports of manufactured by S and N countries

Share of total exports of manufactured by S and N countries

Number of products exported by S and N countries

The organization of this article is as follows: Section II provides a brief literature review of the PTAs, South–South trade and the importance of the structure of trade. Section III introduces the methodology and data. Section IV presents the empirical results fol- lowed by a discussion of the robustness tests. Section V concludes. This is the introduction section. Here is a citation: [1]

2 Literature Review

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

2.1 Theoretical Framework

Stumbling block vs building block dichotomy.

2.1.1 Comparative advantage and trade creation and diversion

Traditional trade theory emphasizes trade creation (allowing cheaper products from PTA members to substitute for more expensive domestic products) and trade diversion (substituting products from non-PTA members that were cheaper before the PTA with products

from PTA members that are cheaper now due to the PTA reducing tariffs) (Schiff, Winters and Schiff, 2003) and argues that the impact of PTAs depends on the comparative advantage of member countries. In particular, it argues that PTAs magnify the impacts of a country's comparative advantage, relative to the world and to other member countries signatories of a common PTA. If member countries of a PTA 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. (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 lower-income country should seek a PTA with the other high-income country as it will gain more. On the contrary, if both members are lower-income countries, the country with the "extreme" comparative advantage, should not seek a PTA with the other low-income member country as it will be vulnerable. (Sanguinetti, Siedschlag and Martincus, 2010). This logic can be easily extended to the North-South and South-South types of PTAs, 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 labour-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. (Schiff, Winters and Schiff, 2003). Also, South countries can benefit from greater technological diffusion from North-South PTAs as the "North" countries have higher industrial development as well as investment in research (Schiff and Wang, 2008). Finally, as the trend in manufacturing has been in favour of vertical specialization or value chain fragmentation (Krugman, 1995), North-South PTAs 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.

2.1.2 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 analysing the effect of PTAs. Developing countries can use PTAs to overcome limitations of their domestic market size in the industrialization process (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 (Fugazza and Robert-Nicoud, 2006). Also, due to similarities in production patterns and resource base among developing countries, incentivising trade by lowering barriers could facilitate appropriate technology transfer, according to the needs of developing countries (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 (Hausmann, Hwang and Rodrik, 2007). Furthermore, by allowing for factor accumulation, PTAs 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, PTAs among "South" countries can reduce intra-South barriers and lead to industrialization of the region (Puga and Venables, 1998). In this context, what matters are not static gains from PTAs, but dynamic gains in industrial development. If South-South PTAs truly promote industrial development of member countries, they might be desirable even if there are short-term losses due to trade diversion (Dahi and Demir, 2013). Other arguments in the development literature emphasize the asymmetries in bargaining power between "North" and "South" countries, which could lead to worse outcomes for developing countries if their policy space gets restricted (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.

2.2 Empirical Evidence

The preference of a type of partner in a PTAs then becomes an empirical question. Do South-South PTAs promote trade and industrial development among their members? The empirical literature overall reports positive effects of PTAs 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 PTAs 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 (Cipollina and Salvatici, 2010). Furthermore, a survey of the empirical research on the effect of economic integration agreements on international trade flows, as well 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 (Kohl, 2014). However, much of the empirical research is focused on the effects of PTAs on or including the most advanced economies. Empirical research focused exclusively on the effects of South-South PTAs or comparing them to the effects of North-North or North-South PTAs, is much less prevalent in the literature. However, 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 PTAs (Medvedev, 2006; Mayda and Steinberg, 2007; Dahi and Demir, 2013; Deme and Ndrianasy, 2017), but these articles tend to be limited in their scope, sample size or only focus on trade volumes.

2.3 Significance of Exports

Significance of Exports

3 Methodology

3.1 Empirical Strategy

3.1.1 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 our 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) we 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 we aim to do with the effects of North-South versus South-South agreements. Third, model has a flexible structure, which will allow us to construct a specification tailored to our research. Finally, fourth, it holds consistent and remarkable predictive power, both with aggregate and sectoral data (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" (Anderson 1979). The more trade barriers or resistance to trade exists with other countries relative to a 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 the Armington-CES assumption (Yotov et al. 2016; Chatzilazarou and Dadakas 2023), which led us to today's generalized form of the gravity equation, as developed and popularised by Anderson and van Wincoop (Anderson and van Wincoop 2003).

Equally important, several empirical developments have strengthened the gravity model and inform our 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 (Olivero and Yotov 2012); As the gravity model is often estimated with an OSL estimator, zero-trade flows were dropped from the sample when trade was transformed into a logarithmic form. Also, trade data is recognized to suffer from heteroscedasticity (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 (Silva and Tenreyro 2006; Santos Silva and Tenreyro 2011); Country-pair fixed effects has been proposed to account for the unobserved endogeneity of trade policy (Baier and Bergstrand 2007). It is worth nothing that the inclusion of exporter-time and importer-time fixed effects will absorb all observable and unobservable time-varying country-specific characteristics that could affect the dependent variable, while the country-pair fixed effects will absorb observable and unobservable bilateral time-invariant characteristics that could affect trade costs; The inclusion of intra-trade flows as well as international trade flows is proposed to correctly estimate the effects of non-discriminatory trade policy, allowing for consumers to choose products from both international and domestic sources (Dai, Yotov, and Zylkin 2014; Heid, Larch, and Yotov 2017); Year-intervals instead of data pooled over consecutive years should be used to allow for adjustment of trade flows to policies that might not have immediate effects (Baier and Bergstrand 2007; Anderson and Yotov 2016); And finally, to account for the effects of globalization forces that may biased the estimates of trade policies, a set of globalization dummies are recommended to control for the effects of globalization in the gravity model (Yotov 2012; Bergstrand, Larch, and Yotov 2015).

3.1.2 Benchmark Model

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

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

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; $\gamma_{\left(\frac{-}{ij}\right)}$ is a country-pair fixed-effect; $PTA_{ij,t}$ and $PTA_{ij,t-5}$ are our main variables of interest, which, respectively indicate if i and j are members of a PTA at time t and, to account for potential "phase-in" effects over time of the PTA, at time $t-5$; $\sum_t b_t$ 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.

3.1.3 PTA Heterogeneity Model

In contrast with our main interest of research, which are the potential heterogenous effects of PTAs 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 PTAs on trade 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 PTA effects as proposed by Baier *et al.* (Baier, Yotov, and Zylkin 2019):

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

Equation (2) can be implemented to account for heterogeneous effects of PTAs 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: $\beta_A = \beta_{1,A} + \beta_{2,A}$.

3.1.4 North-North, North-South and South-South PTAs

In order to analyse the differentiated effects of North-North, North-South and South-South PTAs, we extend both models to get estimates for each type of PTA. Our benchmark model is extended as follows:

$$X_{ij,t} = \exp\Big(\eta_{i,t} + \psi_{j,t} + \gamma_{\binom{-}{ij}} + \beta_{1NN}\, PTA\_NN_{ij,t} + \beta_{2NN}\, PTA\_NN_{ij,t-5} + \beta_{1NS}\, PTA\_NS_{ij,t} + \beta_{2NS}\, PTA\_NS_{ij,t-5} + \beta_{1SS}\, PTA\_SS_{ij,t} + \beta_{2SS}\, PTA\_SS_{ij,t-5} + \sum_t b_t\Big) + \epsilon_{ij,t} \quad (3)$$

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; $\gamma_{\binom{-}{ij}}$ is a country-pair fixed effect; β_{1NN} and β_{2NN} are the coefficients for the immediate and lagged effects of a North-North PTA (PTA_NN); β_{1NS} and β_{2NS} are the coefficients for the immediate and lagged effects of a North-South PTA (PTA_SN); β_{1SS} and β_{2SS} are the coefficients for the immediate and lagged effects of a South-South PTA (PTA_SS); $\sum_t b_t$ is a set of time dummies accounting for international trade-specific effects at each time t; and $\epsilon_{ij,t}$ is the error term.

Equation (2) also gets extended to capture the heterogeneous effects of the different types of PTAs as follows:

$$X_{ij,t} = \exp\Big(\eta_{i,t} + \psi_{j,t} + \gamma_{\binom{-}{ij}} + \sum_A (\beta_{1,A,NN}\, PTA\_NN_{ij,t} + \beta_{2,A,NN}\, PTA\_NN_{ij,t-5}) + \sum_A (\beta_{1,A,NS}\, PTA\_NS_{ij,t} + \beta_{2,A,NS}\, PTA\_NS_{ij,t-5}) + \sum_A (\beta_{1,A,SS}\, PTA\_SS_{ij,t} + \beta_{2,A,SS}\, PTA\_SS_{ij,t-5}) + \sum_t b_t\Big) + \epsilon_{ij,t} \quad (4)$$

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; $\gamma_{\binom{-}{ij}}$ 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 PTAs (PTA_NN); $\beta_{1,A,NS}$ and $\beta_{2,A,NS}$: Coefficients for the immediate and lagged effects of North-South PTAs (PTA_SN); $\beta_{1,A,SS}$ and $\beta_{2,A,SS}$: Coefficients for the immediate and lagged effects of South-South PTAs (PTA_SS); $\sum_t b_t$ 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 we use the following variables: $PTA\_NN_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-North and part of a PTA at time t, and 0 otherwise; $PTA\_NN_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-North and was part of a PTA at time t-*5*, and 0 otherwise; $PTA\_NS_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-South and part of a PTA at time t, and 0 otherwise; $PTA\_NS_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is North-South and was part of a PTA at time t-*5*, and 0 otherwise; $PTA\_SS_{ij,t}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is South-South and part of a PTA at time t, and 0 otherwise; $PTA\_SS_{ij,t-5}$ is a dummy variable that takes the value of 1 if the trade pair (i, j) is South-South and was part of a PTA at time t-*5*, and 0 otherwise;

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

3.2 Export Product Unit Value

Inspired by other strands of the international trade literature, we also test our models using "Unit Values" of the products exported, by dividing the total value exported by the total weight exported in kilograms (Latzer and Mayneris 2021; Manova and Zhang 2012; Bastos and Silva 2010). Using the unit value as the dependent variable in our estimations allow us to analyse if the value per unit exported is affected by PTAs. To be consistent in our effort to understand the potentially heterogenous effects of PTAs according to the different category of the members in trade volume, but also in quality upgrading and industrialization development of countries, we focus on manufacturing products (Chatzilazarou and Dadakas 2023) with HS 2-digit codes 84 (Nuclear reactors, boilers, 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. Our aim is to compare the effects of PTAs on trade volumes against the effects on the unit value of manufacturing products exported.

3.3 Defining North and South

Defining which countries belong to the "North" and "South" categories is a key step in order to properly analyse the impact of PTAs on different bilateral export relationships. However, it is important to consider that any way in which we categorize countries can be criticised for not taking into consideration the diverse and heterogenous characteristics of individual countries within each group. Furthermore, especially since our focus is to analyse 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 well 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, we will not consider such heterogeneity within groups, and just focus on categorising 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 PTA effects.

One intuitive approach could be to categorize countries based on their income level, but this approach would need 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 we 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, we have decided to use the same categorization of countries as Dahi & Demir (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". A detailed list of the countries and their categories can be found in the Appendix.

3.4 Data

To construct our dataset we have combined PTA data from the "Design of International Trade Agreements" (DESTA) (Dür, Andreas, Leonardo Baccini and Manfred Elsig 2014) and from the CEPII "Trade and Production Database" (TradeProd) (Thierry Mayer, Gianluca Santoni, Vincent Vicard 2023). The DESTA database aims to aggregate all agreements that have the potential to liberalise trade, including all agreements notified to the World Trade Organisation (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.

Our sample consists of PTAs signed between the years 2000 to 2010 and the country members to these PTAs, totalling 154 agreements and 143 member countries. For ease of estimation, and to get a sense of geographical differences, we estimate our models by PTA region for five main regions: Africa, Americas, Asia, Europe and Intercontinental (We exclude Oceania [11 countries and 1 agreement] for lack of sufficient trade data for our 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 our sample, we 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). We also download export data directly from COMTRADE for all countries in our sample to construct our export product unit value measurements. For estimations on trade flows, we use international trade flow data as reported by importer. In order to measure the appropriate lags for the effects of each agreement, our period of interest for international flow data is between 1995 to 2015, and since we are estimating in 5-year intervals, we 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 weight 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 PTAs downwards (Yotov et al. 2016), so we use this estimates as illustrative conservative measurements of the effects of PTAs on the unit value of exported products.

4 Findings

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

4.1 Benchmark Results

We begin by briefly discussing the results of our benchmark estimation by region, contained in Table 1. We immediately see that the average "cumulative" effects of PTAs on trade flows after accounting for phase-in effects (the sum of the current and lagged PTA estimates), is heterogenous across regions. Only Americas, Europe and Intercontinental PTAs have statistically significant results, with all coefficients being positive and generally similar to the results we would expect according to the literature. The smallest effect, that of Intercontinental PTAs, has a statistically significant coefficient at the 5% of 0.203 with a standard error of (0.106). We interpret this coefficient as Intercontinental PTAs having an average a partial effect of (exp(0.203)-1)x100%. = 22.5% increase in trade flows. The largest effect, that of Europe's PTAs, has a statistically significant coefficient at the 1% of 0.475 with a standard error of (0.025). We interpret this coefficient as Europe's PTAs 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 PTA coefficient is highly significant and positive, and PTA Lag is not significant and negative, while Asia's PTA coefficient is not significant and positive, and PTA Lag is highly significant and negative.

Table 1: Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
PTA	0.578***	0.287***	0.064	0.237***	0.015
	(0.154)	(0.071)	(0.083)	(0.019)	(0.093)
PTA Lag	-0.278	0.146	-0.167***	0.238***	0.188***
	(0.300)	(0.149)	(0.056)	(0.022)	(0.043)
PTA + PTA Lag	0.301	0.433***	-0.103	0.475***	0.203*
	(0.295)	(0.140)	(0.094)	(0.025)	(0.106)
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	0.999	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.

4.2 PTA Heterogeneity Results

The results of our model allowing for heterogenous effects of PTAs is shown in Table 2 through Table 6. Again, we can observe significant heterogeneity across regions and PTAs. Africa in Table 2 has no statistically significant effect for any PTA. Americas in Table 3 has ten PTAs with statistically significant and positive coefficients, two with no statistically significant effect, and one PTA with a statistically significant and negative coefficient. Asia in Table 4 has eight PTAs with statistically significant and positive coefficients, nine with no statistically significant effect, and four PTAs with statistically significant and negative coefficients. Europe in Table 5 has eighteen PTAs with statistically significant and positive coefficients, nine with no statistically significant effect, and one PTA with a statistically significant and negative coefficient. And finally, Intercontinental in Table 6 has twenty-eight PTAs with statistically significant and positive coefficients, twenty with no statistically significant effect, and six PTAs 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 significand and negative effects.

Table 2: PTA + PTA Lag Coefficients for Africa Region

Statistically Insignificant		
PTA ID	Estimate	SE
670	0.326	(0.410)
787	0.304	(0.233)
Exporter-Year FE	Yes	
Importer-Year FE	Yes	
Country-Pair FE	Yes	
R-Squared	0.997	
Observations	5838	

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 3: PTA + PTA Lag Coefficients for Americas Region

Positive and Statistically Significant		
PTA ID	Estimate	SE
213	1.342***	(0.434)
218	0.879***	(0.173)
239	0.571***	(0.173)
616	0.488***	(0.044)
168	0.410***	(0.113)
163	0.342***	(0.096)
141	0.265***	(0.024)
716	0.732**	(0.358)
201	0.545**	(0.265)
612	0.515**	(0.251)
Statistically Insignificant		
PTA ID	Estimate	SE
185	0.291	(0.376)
645	0.117	(0.141)
Negative and Statistically Significant		
PTA ID	Estimate	SE
188	-0.774***	(0.144)
Exporter-Year FE	Yes	
Importer-Year FE	Yes	
Country-Pair FE	Yes	
R-Squared	0.999	
Observations	10997	

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 4: PTA + PTA Lag Coefficients for Asia Region

Positive and Statistically Significant		
PTA ID	Estimate	SE
683	1.080***	(0.237)
70	0.472***	(0.150)
100	0.376***	(0.105)
67	0.342***	(0.125)
675	1.360**	(0.655)
475	0.636**	(0.298)
598	0.166**	(0.083)
474	0.419*	(0.243)
Statistically Insignificant		
PTA ID	Estimate	SE
72	0.254	(0.178)
116	0.256	(0.703)
492	0.041	(0.180)
640	0.183	(0.217)
223	-0.014	(0.203)
71	-0.138	(0.091)
456	-0.209	(0.165)
534	-0.165	(0.370)
667	-0.049	(0.241)
Negative and Statistically Significant		
PTA ID	Estimate	SE
221	-2.955***	(0.727)
220	-1.215***	(0.093)
599	-0.967***	(0.191)
1	-0.732**	(0.359)
Exporter-Year FE	Yes	
Importer-Year FE	Yes	
Country-Pair FE	Yes	
R-Squared	0.999	
Observations	25308	

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 5: PTA + PTA Lag Coefficients for Europe Region

Positive and Statistically Significant		
PTA ID	Estimate	SE
5	3.812***	(0.278)
128	2.712***	(0.211)
13	2.256***	(0.262)
132	2.241***	(0.252)
192	1.107***	(0.163)
7	1.153***	(0.272)
328	0.671***	(0.175)
8	0.667***	(0.161)
621	0.618***	(0.186)
135	0.615***	(0.217)
254	0.565***	(0.084)
394	0.745***	(0.202)
335	0.472***	(0.025)
129	0.553***	(0.206)
9	0.580**	(0.285)
11	0.656**	(0.307)
131	0.615**	(0.281)
594	0.474*	(0.251)
Statistically Insignificant		
PTA ID	Estimate	SE
6	0.355	(0.358)
150	0.247	(0.687)
153	0.614	(0.633)
154	0.592	(0.409)
255	0.167	(0.237)
389	0.412	(0.323)
331	0.142	(0.201)
12	-0.246	(1.208)
156	-0.441	(0.445)
Negative and Statistically Significant		
PTA ID	Estimate	SE
133	-0.772***	(0.248)
Exporter-Year FE	Yes	
Importer-Year FE	Yes	
Country-Pair FE	Yes	
R-Squared	0.997	
Observations	28168	

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 6: PTA+PTALag Coefficients for Intercontinental

Positive and Statistically Significant		
PTA ID	Estimate	SE
627	2.372***	(0.345)
415	1.853***	(0.201)
206	1.539***	(0.180)
75	1.366***	(0.493)
263	1.426***	(0.115)
4	1.254***	(0.268)
626	1.099***	(0.121)
657	0.705***	(0.082)
637	0.667***	(0.102)
202	0.658***	(0.123)
208	0.763***	(0.129)
136	0.744***	(0.185)
490	0.843***	(0.181)
17	0.811***	(0.242)
466	0.710***	(0.147)
304	0.770***	(0.120)
628	0.484***	(0.142)
207	0.516***	(0.114)
518	0.627***	(0.135)
330	0.314***	(0.086)
164	0.288***	(0.073)
96	0.271***	(0.055)
181	0.392**	(0.178)
624	0.388**	(0.163)
521	0.101**	(0.045)
384	0.645*	(0.355)

Continued on next page

Table 6 – continued from previous page

PTA ID	Estimate	SE
15	0.313*	(0.179)
227	0.348*	(0.186)
Statistically Insignificant		
PTA ID	Estimate	SE
641	2.028	(1.255)
543	1.090	(0.707)
509	0.210	(0.216)
252	0.192	(0.357)
508	0.140	(0.122)
376	0.172	(0.228)
416	0.424	(0.295)
401	0.407	(0.288)
152	0.110	(0.266)
242	0.050	(0.294)
390	0.0471	(0.181)
396	0.019	(0.379)
205	0.0012	(0.178)
602	-0.076	(0.918)
383	-0.202	(0.152)
386	-0.092	(0.168)
84	-0.059	(0.120)
979	-0.126	(0.294)
644	-0.189	(0.122)
658	-0.303	(0.349)
Negative and Statistically Significant		
PTA ID	Estimate	SE
399	-0.473***	(0.127)
104	-0.338***	(0.112)

Continued on next page

Table 6 – continued from previous page

PTA ID	Estimate	SE
677	-1.366***	(0.385)
679	-1.429***	(0.430)
323	-0.338**	(0.138)
512	-0.458*	(0.266)
Exporter-Year FE	Yes	
Importer-Year FE	Yes	
Country-Pair FE	Yes	
R-Squared	0.998	
Observations	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.

4.3 North-North, North-South and South-South PTAs

4.3.1 North-South Benchmark Results

We present the results of our extended models allowing us to capture the differentiated effects of PTAs on bilateral exports depending on whether the pair country 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 7 again show heterogenous results across regions. It is interesting to note that by disaggregating the PTA 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 PTA + Lag and SS PTA + Lag , but the effects are larger in both cases for the SS PTA + Lag coefficient. Asia now has a slightly significant and negative coefficient for NS PTA + Lag while the coefficient for SS PTA + Lag remains not significant. Intercontinental have significant and positive effects of NS Lag and SS Lag, but NS PTA + Lag and SS PTA + Lag are both not significant now. Africa's coefficients remain not significant, and it is the

only region with only South-South PTAs.

Table 7: Regional Results by PTA Type

	Africa	Americas	Asia	Europe	Intercontinental
Variables					
NN PTA				0.207***	0.013
				(0.021)	(0.072)
NN PTA Lag				0.192***	0.016
				(0.023)	(0.073)
NN PTA + NN PTA Lag				0.399***	0.029
				(0.026)	(0.102)
NS PTA		0.199***	-0.089	0.374***	0.013
		(0.069)	(0.089)	(0.041)	(0.144)
NS PTA Lag		0.234	-0.067	0.349***	0.231***
		(0.190)	(0.060)	(0.041)	(0.061)
NS PTA + NS PTA Lag		0.434**	-0.156*	0.723***	0.244
		(0.200)	(0.090)	(0.046)	(0.156)
SS PTA	0.578***	0.476***	0.153	0.530***	0.004
	(0.154)	(0.139)	(0.117)	(0.107)	(0.121)
SS PTA Lag	-0.278	-0.023	-0.208***	0.575***	0.204***
	(0.300)	(0.133)	(0.063)	(0.119)	(0.073)
SS PTA + SS PTA Lag	0.301	0.453***	-0.055	1.105***	0.208
	(0.295)	(0.112)	(0.130)	(0.092)	(0.128)
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	0.999	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.

4.3.2 North-South PTA Heterogeneity Results

The results of our extended model allowing for heterogenous effects of PTAs is shown in Table 8 through Table 12. Africa in table 8 only has effects for South-South PTAs and again has no statistically significant effect for any PTA. Americas in Table 9 has five PTAs with North-South estimates, one of which has statistically significant and negative effects for NS PTA + Lag and statistically significant and positive effects for SS PTA + Lag. Of the remaining four, none have estimates for SS PTA + Lag, three are statistically significant and positive, and one is not statistically significant. It has eight PTAs 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 in Table 10 has two PTAs with North-South estimates, one of which is statistically significant and positive, while the other is not statistically significant. It has nineteen PTAs 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 in Table 11 has eight PTA 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 PTA + Lag also has a statistically significant and positive coefficient for SS PTA + Lag. None of the other agreements with a NS coefficient have statistically significant coefficients for SS. It has nineteen South-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 in Table 12 has thirty PTA 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 PTA + Lag. None of these PTAs also have coefficients for SS PTA + Lag of which five are statistically significant and positive, three are not statistically significant, and one is statistically significant and negative. It has twenty-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 PTAs, 23 out of 47 (48.94%) NS coefficients have significant and positive effects, 20 out of 47 (42.55%) have no significant effects, and 4 out of 47 (8.51%) have significand and negative effects; 49 out of 84 (58.33%) SS coefficients have significant and positive effects, 27 out of 84 (32.14%) have no significant effects, and 8 out of 84 (9.52%) have significand and negative effects; and, 3 out of 4 (75%) NN coefficients have significant and positive effects, 1 out of 4 (25%) have no significant effects, and none have significand and negative effects.

Table 8: Africa PTA + PTA Lag Coefficients by Type

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
NS and SS (or only NS)			
No agreements in this category			
Only SS			
670		0.326	
		(0.410)	
787		0.304	
		(0.233)	
Agreements with NN and NS			
No agreements in this category			
Exporter-Year FE	Yes		
Importer-Year FE	Yes		
Country-Pair FE	Yes		
R-Squared	0.997		
Observations	5838		

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 9: Americas PTA + PTA Lag Coefficients by Type

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
Agreements with NS and SS (or only NS)			
188	-0.811***	0.685**	
	(0.140)	(0.317)	
163	0.346***		
	(0.098)		
168	0.410***		
	(0.113)		
218	0.879***		
	(0.172)		
645	0.117		
	(0.141)		
Agreements with only SS			
141		0.265***	
		(0.024)	
213		1.342***	
		(0.435)	
239		0.572***	
		(0.173)	
616		0.488***	
		(0.044)	
201		0.545**	
		(0.265)	
716		0.732**	
		(0.358)	
612		0.517**	
		(0.251)	
185		0.295	
		(0.375)	
Agreements with NN and NS			
No agreements in this category			
Exporter-Year FE	Yes		
Importer-Year FE	Yes		
Country-Pair FE	Yes		
R-Squared	0.999		
Observations	10997		

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 10: Asia PTA + PTA Lag Coefficients by Type

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
Agreements with NS and SS (or only NS)			
598	0.166**		
	(0.083)		
71	-0.138		
	(0.091)		
Agreements with only SS			
70		0.472***	
		(0.150)	
100		0.376***	
		(0.105)	
67		0.342***	
		(0.125)	
683		1.080***	
		(0.237)	
599		-0.967***	
		(0.191)	
220		-1.215***	
		(0.093)	
221		-2.955***	
		(0.0.727)	
675		1.360**	
		(0.655)	
475		0.636**	
		(0.298)	
1		-0.732**	
		(0.359)	
474		0.419*	
		(0.243)	
116		0.256	
		(0.703)	
72		0.254	
		(0.178)	
492		0.041	
		(0.180)	
640		0.183	
		(0.217)	
667		-0.049	
		(0.241)	
534		-0.165	
		(0.370)	
223		-0.014	
		(0.203)	
456		-0.209	
		(0.165)	
Agreements with NN and NS			
No agreements in this category			
Exporter-Year FE	Yes		
Importer-Year FE	Yes		
Country-Pair FE	Yes		
R-Squared	0.999		
Observations	25308		

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 11: Europe PTA + PTA Lag Coefficients by Type

Agreements with NS			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
8	0.663***	0.783***	
	(0.165)	(0.248)	
254	0.568***	0.323	
	(0.086)	(0.430)	
328	0.738***	0.354	
	(0.179)	(0.291)	
331	0.241	-0.032	
	(0.216)	(0.338)	
394	0.747***		
	(0.200)		
9	0.581**		
	(0.285)		
255	0.171		
	(0.235)		
389	0.411		
	(0.333)		
Agreements with only SS			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
5		3.811***	
		(0.278)	
132		2.241***	
		(0.252)	
7		1.153***	
		(0.271)	
13		2.303***	
		(0.246)	

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Table 11 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
128		2.773***	
		(0.213)	
129		0.556***	
		(0.208)	
135		0.696***	
		(0.206)	
192		1.199***	
		(0.152)	
621		0.614***	
		(0.186)	
133		-0.707***	
		(0.225)	
11		0.663**	
		(0.298)	
131		0.599**	
		(0.276)	
154		0.773**	
		(0.354)	
594		0.455*	
		(0.249)	
150		0.444	
		(0.679)	
153		0.817	
		(0.596)	
6		0.411	
		(0.352)	
156		-0.372	
		(0.428)	
12		-0.250	

Continued on next page

Table 11 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
		(1.207)	
Agreements with NN			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
335	0.727***	1.099***	0.399***
	(0.047)	(0.098)	(0.025)
Exporter-Year FE	Yes		
Importer-Year FE	Yes		
Country-Pair FE	Yes		
R-Squared	0.997		
Observations	28168		

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 12: Intercont PTA+Lag Coefficients by Type

Agreements with NS			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
17	0.800***	1.055***	
	(0.249)	(0.244)	
330	0.286***	0.662***	
	(0.088)	(0.188)	
304	0.787***	0.591**	
	(0.123)	(0.245)	
202	0.660***	0.612**	
	(0.124)	(0.241)	
679	0.546*	-1.636***	
	(0.310)	(0.400)	

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Table 12 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
323	-0.335**	-0.360	
	(0.146)	(0.247)	
181	0.242	1.288***	
	(0.179)	(0.309)	
252	0.165	0.580	
	(0.363)	(0.387)	
979	-0.130	0.061	
	(0.298)	(0.855)	
75	1.366***		
	(0.492)		
96	0.271***		
	(0.055)		
207	0.516***		
	(0.113)		
518	0.627***		
	(0.135)		
628	0.484***		
	(0.142)		
637	0.667***		
	(0.102)		
399	-0.473***		
	(0.127)		
384	0.645*		
	(0.355)		
512	-0.458*		
	(0.266)		
543	1.090		
	(0.707)		
376	0.171		

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Table 12 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
	(0.228)		
152	0.110		
	(0.266)		
205	0.002		
	(0.178)		
390	0.047		
	(0.181)		
396	0.018		
	(0.379)		
401	0.407		
	(0.288)		
508	0.140		
	(0.122)		
509	0.210		
	(0.216)		
658	-0.303		
	(0.349)		
383	-0.202		
	(0.152)		
386	-0.092		
	(0.168)		
Agreements with only SS			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
627		2.372***	
		(0.345)	
415		1.854***	
		(0.201)	
4		1.255***	
		(0.268)	

Continued on next page

Table 12 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
626		1.099***	
		(0.121)	
104		-0.338***	
		(0.112)	
136		0.744***	
		(0.185)	
208		0.763***	
		(0.129)	
657		0.705***	
		(0.082)	
206		1.540***	
		(0.180)	
263		1.426***	
		(0.115)	
466		0.710***	
		(0.147)	
490		0.843***	
		(0.181)	
677		-1.366***	
		(0.385)	
624		0.384**	
		(0.163)	
15		0.313*	
		(0.179)	
227		0.348*	
		(0.186)	
242		0.050	
		(0.294)	
416		0.424	

Continued on next page

Table 12 – continued from previous page

PTA ID	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag
		(0.295)	
641		2.027	
		(1.255)	
644		-0.190	
		(0.122)	
602		-0.076	
		(0.918)	
Agreements with NN			
PTA ID	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+Lag**
164			0.288***
			(0.073)
521			0.102**
			(0.045)
84			-0.059
			(0.120)
Exporter-Year FE	Yes		
Importer-Year FE	Yes		
Country-Pair FE	Yes		
R-Squared	0.998		
Observations	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.

4.4 Export Product Unit Value Results

Finally, we present the results of running our estimations substituting trade flows as our 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 analyse if the effect of PTAs

goes beyond trade volumes. For ease of comparison, we ran each estimation twice 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.

Tables 13 and 14, and 15 and 16, show the results of our benchmark model for each region for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. We continue to observe heterogeneous results across regions. In table 13, for the trade volume of HS 84, none of the PTA + Lag coefficients are statistically significant with the exception of the Intercontinental region, for which it is statistically significant and negative. In table 14, 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 PTAs reduced the volume of trade of HS 84 products but increased the value per unit. In table 15, for the trade volume of HS 85, PTA + 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 16, 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 17 and 18, and 19 and 20, show the results of our extended benchmark model with North-North, North-South and South-South PTAs, for each region for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. In table 17, for the trade volume of HS 84, we observe that for North-North trade, PTA + Lag coefficient for Intercontinental has a significant and positive coefficient, while Europe's is not significant. For North-South trade PTA + 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, PTA + Lag for Africa, Asia and Europe do not have significant coefficients, while the coefficients of Americas and Intercontinental are significant and negative. In table 18, for the unit value of the product exported of HS 84, for North-North trade's PTA + Lag, Europe's coefficient is significant and positive and the coefficient of Intercontinental is not significant. For North-South trade, none of the PTA +

Lag coefficients are significant. For South-South trade, the PTA + 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 Intercontinental PTAs decreased, the value per unit of South-South trade increased. In table 19, for the trade volume of HS 85, we observe that for North-North trade, PTA + Lag coefficient for Intercontinental has a significant and positive coefficient, while Europe's is not significant. For North-South trade PTA + Lag coefficients are not significant for Americas, Asia and Intercontinental, while they are significant and negative for Europe. For South-South trade, PTA + Lag for Americas, Asia, Europe and Intercontinental do not have significant coefficients, while the coefficient of Africa is significant and positive. In table 20, for the unit value of the product exported of HS 85, for North-North trade's PTA + Lag, Europe and Intercontinental's coefficients are not significant. For North-South trade, the PTA + Lag coefficients for Americas and Europe are not significant, while they are significant and negative for Asia and Intercontinental. For South-South trade, the PTA + 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 21 and 22, and 23 and 24, we include the estimates of our model allowing for PTA specific effects, extended with North-North, North-South and South-South PTAs, for Africa and Americas, for trade volumes and the unit value of the product exported, and for HS 84 and 85, respectively. In table 21, for the trade volumes of HS 84 and 85 for Africa, which only has South-South PTAs, we can see that PTA 670 had statistically significant and negative effects on the trade volume of HS 84, and not significant for HS 85. PTA 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 22, for the unit value of products HS 84 and 85 exported for the region of Africa, we can see that PTA 670 did not have significant effects on the value per unit of products in HS 84 and 85. PTA 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 we can see a that a PTA has a significant effect on

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

In table 23, for the trade volumes of HS 84 and 85, and table 24 for the unit value of products HS 84 and 85, all for the region of Americas, which has North-South and South-South PTAs, we can observe heterogeneous effects of different PTAs on the different types of bilateral trade relationships. One interesting example is PTA 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.

Table 13: HS 84 Trade Volume Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML	PPML	PPML	PPML	PPML
	Africa	Americas	Asia	Europe	Intercontinental
PTA	-0.364	-0.289*	-0.005	0.288**	-0.411***
	(0.695)	(0.162)	(0.078)	(0.146)	(0.099)
PTA Lag	-0.247	-0.024	-0.053	-0.233*	-0.081
	(0.403)	(0.120)	(0.048)	(0.122)	(0.077)
PTA + PTA 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.

Table 14: HS 84 Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
PTA	1.676***	-0.037	0.130	0.164	-0.236
	(0.592)	(0.356)	(0.165)	(0.223)	(0.150)
PTA Lag	-2.388***	-0.615	-0.129	0.238	0.534***
	(0.517)	(0.484)	(0.136)	(0.188)	(0.156)
PTA + PTA Lag	-0.712	-0.652*	0.001	0.402*	0.298**
	(0.492)	(0.339)	(0.192)	(0.216)	(0.141)
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 in parentheses. Significance levels are indicated as follows: *p<0.1; **p<0.05; ***p<0.01.

Table 15: HS 85 Trade Volume Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
PTA	0.023	-0.106	0.140	-0.138	0.142*
	(0.419)	(0.178)	(0.088)	(0.152)	(0.072)
PTA Lag	1.009**	0.052	-0.070	-0.311**	-0.209**
	(0.441)	(0.172)	(0.058)	(0.127)	(0.926)
PTA + PTA Lag	1.033**	-0.055	0.069	-0.449***	-0.067
	(0.404)	(0.253)	(0.102)	(0.165)	(0.872)
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.

Table 16: HS 85 Benchmark Model Regional Results

	(1)	(2)	(3)	(4)	(5)
Variables					
	PPML Africa	PPML Americas	PPML Asia	PPML Europe	PPML Intercontinental
PTA	2.098**	-0.360	0.965***	-0.198	-0.010
	(1.032)	(0.583)	(0.324)	(0.278)	(0.190)
PTA Lag	-0.478	0.421	-0.299	-0.184	- 0.280
	(0.650)	(0.408)	(0.294)	(0.247)	(0.208)
PTA + PTA Lag	1.620	0.062	0.666	-0.382	-0.290*
	(1.150)	(0.524)	(0.494)	(0.333)	(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.

Table 17: HS 84 Trade Volume Regional Results by PTA Type

	Africa	Americas	Asia	Europe	Intercontinental
Variables					
NN PTA				-0.087	0.084
				(0.163)	(0.080)
NN PTA Lag				-0.234	0.187*
				(0.191)	(0.098)
NN PTA + NN PTA Lag				-0.321	0.272**
				(0.233)	(0.121)
NS PTA		-0.082	-0.001	0.236*	-0.455***
		(0.108)	(0.096)	(0.133)	(0.104)
NS PTA Lag		0.294*	-0.079	-0.242*	-0.126
		(0.151)	(0.059)	(0.139)	(0.093)
NS PTA + NS PTA Lag		0.212**	-0.080	-0.006	-0.580***
		(0.097)	(0.112)	(0.169)	(0.111)
SS PTA	-0.364	-0.310*	-0.006	0.417*	-0.315***
	(0.695)	(0.189)	(0.117)	(0.215)	(0.102)
SS PTA Lag	-0.247	-0.123	-0.037	-0.129	0.057
	(0.403)	(0.112)	(0.080)	(0.160)	(0.082)
SS PTA + SS PTA 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.

Table 18: HS 84 Regional Results by PTA Type

	Africa	Americas	Asia	Europe	Intercontinental
Variables					
NN PTA				0.316	0.584
				(0.258)	(0.516)
NN PTA Lag				0.250	-0.740**
				(0.226)	(0.296)
NN PTA + NN PTA Lag				0.566**	-0.155
				(0.266)	(0.362)
NS PTA		1.033**	0.403	0.202	-0.345**
		(0.471)	(0.278)	(0.236)	(0.166)
NS PTA Lag		-1.925***	-0.005	0.139	0.576***
		(0.609)	(0.244)	(0.202)	(0.180)
NS PTA + NS PTA Lag		-0.891	0.399	0.341	0.231
		(0.601)	(0.268)	(0.227)	(0.170)
SS PTA	1.676***	-0.974***	-0.004	0.097	-0.063
	(0.592)	(0.324)	(0.195)	(0.265)	(0.231)
SS PTA Lag	-2.388***	0.603*	-0.148	0.327	0.542**
	(0.517)	(0.311)	(0.149)	(0.232)	(0.234)
SS PTA + SS PTA 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.

Table 19: HS 85 Trade Volume Regional Results by PTA Type

	Africa	Americas	Asia	Europe	Intercontinental
Variables					
NN PTA				0.041	0.272**
				(0.208)	(0.128)
NN PTA Lag				-0.160	0.271
				(0.208)	(0.190)
NN PTA + NN PTA Lag				-0.119	0.543**
				(0.246)	(0.274)
NS PTA		-0.494	0.158*	-0.051	0.154*
		(0.345)	(0.085)	(0.152)	(0.084)
NS PTA Lag		0.700***	-0.038	-0.315**	-0.248**
		(0.270)	(0.094)	(0.153)	(0.108)
NS PTA + NS PTA Lag		0.206	0.121	-0.366**	-0.094
		(0.442)	(0.120)	(0.174)	(0.091)
SS PTA	0.023	0.082	0.118	-0.004	0.039
	(0.419)	(0.206)	(0.128)	(0.211)	(0.152)
SS PTA Lag	1.009**	-0.176	-0.088	-0.142	-0.090
	(0.441)	(0.168)	(0.081)	(0.157)	(0.176)
SS PTA + SS PTA 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.

Table 20: HS 85 Regional Results by PTA Type

	Africa	Americas	Asia	Europe	Intercontinental
Variables					
NN PTA				0.024	0.867*
				(0.349)	(0.494)
NN PTA Lag				0.409	-0.847**
				(0.292)	(0.411)
NN PTA + NN PTA Lag				0.433	0.020
				(0.364)	(0.490)
NS PTA		-0.582	0.076	-0.244	-0.133
		(1.139)	(0.388)	(0.332)	(0.198)
NS PTA Lag		0.918	-1.017***	0.084	-0.200
		(0.629)	(0.370)	(0.245)	(0.232)
NS PTA + NS PTA Lag		0.336	-0.941**	-0.160	-0.333*
		(0.851)	(0.407)	(0.356)	(0.199)
SS PTA	2.098**	-0.208	1.662***	-0.218	0.097
	(1.032)	(0.517)	(0.481)	(0.369)	(0.301)
SS PTA Lag	-0.478	0.068	0.026	-0.672**	-0.316
	(0.650)	(0.493)	(0.328)	(0.336)	(0.298)
SS PTA + SS PTA 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.

Table 21: Africa PTA + PTA Lag Coefficients by Type for Trade Volume of HS 84 and HS 85

PTA ID	**HS 84**			**HS 85**		
	NS PTA+Lag	**SS PTA+Lag**	**NN PTA+Lag**	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+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 22: Africa PTA + PTA Lag Coefficients by Type for HS 84 and HS 85

PTA ID	HS 84			HS 85		
	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag	NS PTA+Lag	SS PTA+Lag	NN PTA+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.

Table 23: Americas PTA + PTA Lag Coefficients by Type for Trade Volume of HS 84 and HS 85

PTA ID	HS 84			HS 85		
	NS PTA+Lag	SS PTA+Lag	NN PTA+Lag	NS PTA+Lag	SS PTA+Lag	NN PTA+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 24: Americas PTA + PTA Lag Coefficients by Type for HS 84 and HS 85

PTA ID	**HS 84**			**HS 85**		
	NS PTA+Lag	**SS PTA+Lag**	**NN PTA+Lag**	**NS PTA+Lag**	**SS PTA+Lag**	**NN PTA+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	0.990	0.990	0.990
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.

5 Analysis and Discussion

This is the analysis and discussion

"Several themes emerge from this newly bourgeoning literature. First, South–South trade and finance is now a significant economic and political force for South countries as well as for the global economy. There is a near consensus therefore that South–South economic relations do matter and that they have the potential to have a significant developmental impact. Moreover, this impact may be positive or negative, that is, that it may help or hinder the long-term developmental goals of exchanging parties. Second, much of South–South manufactures trade is concentrated in high-technology-and-skill content, opening the door for potential long-run dynamic gains from trade. However, these gains are being increasingly concentrated within a small number of South countries. The global South is, in fact, splitting into two groups, which we refer to as the Emerging South and the Rest of South with very different outcomes. While there is evidence for gains through South–South trade, there is also evidence that the Emerging South is rising at the expense of the Rest of South. Finally, the South–South exchanges have expanded significantly to cover issues including financial flows and technology transfer, among other topics. The overall conclusion of this diverse literature is that while it does matter who is exchanging what and with whom, South–South trade is not a panacea for the development challenges in Southern countries. On the contrary, South–South exchange themselves may become a potential threat for development for some of the Southern countries." (Dahi & Demir, 2017)

References

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6 Conclusion

This is the conclusion

7 References

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8 Appendix

8.1 Subsection in Appendix

Content in the appendix should not be counted in the word count.