

# India-MERCOSUR Preferential Trade Agreement: An Ex-Post Evaluation under Modern Gravity Framework

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**Abstract** Against the backdrop of expanding the tariff concession list of 450 products to 1500-2000 under India - Southern Common Market Preferential Trade Agreement (India-MERCOSUR PTA), the study analyses the effects of the India-MERCOSUR PTA on the trade flows of member states. The study employs structural gravity model framework to estimate total bilateral, unilateral, and heterogenous trade effects of this PTA. The results indicate that bilateral trade between India and MERCOSUR countries have increased by 63% at the expense of trade diversion from domestic sales. The study also provides evidence that PTA significantly increased India's trade with non-MERCOSUR countries by 90%. In addition, the hypothesis of heterogeneity effects of PTA across each of its member countries and the direction of trade is confirmed by the estimates. Such empirical evidence of large average impacts on goods trade gives significant boost to the ongoing negotiations for further deepening the existing trade agreement.

**Keywords:** Gravity Model, Unilateral Effects, Trade Integration, India, MERCOSUR, Panel Data

*JEL Classifications:* F13, F14, F15

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## I. Introduction

Since May 2011, India and MERCOSUR (South American trade bloc) have shown interest to expand the existing PTA them (called India-MERCOSUR PTA) that had entered into force in June 2009. To be precise, there is an ongoing discussion on expanding the number of goods enjoying tariff concessions under a preferential trade agreement from about 450 to 1500-2000. In view of boosting South-South trade, both the parties have been encouraged to have deeper integration between them and even to extend with SACU (South African Customs Union) to make greater inroads into the other's market. This development comes as India's trade with Latin American countries has boosted up 25 times between 2000-2023. Moreover, closer economic

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ties with MERCOSUR; the fourth-largest trade bloc, could be much beneficial for India in providing access to huge markets for Indian products. Latin America has also reciprocated as they may benefit from increased investments from India. However, owing to bloc's internal issues, the trade talks between India and MERCOSUR to take the relationship to the next level could not be concluded. Amidst the discussion over deepening the current engagement between India and MERCOSUR, an effort to re-assess the economic consequences of India-MERCOSUR PTA for both parties seem imperative. Therefore, the present study endeavours to contribute to this debate by answering the question, i.e., whether current PTA between India-MERCOSUR has been successful to make trade relationship between both the parties stronger and deeper?

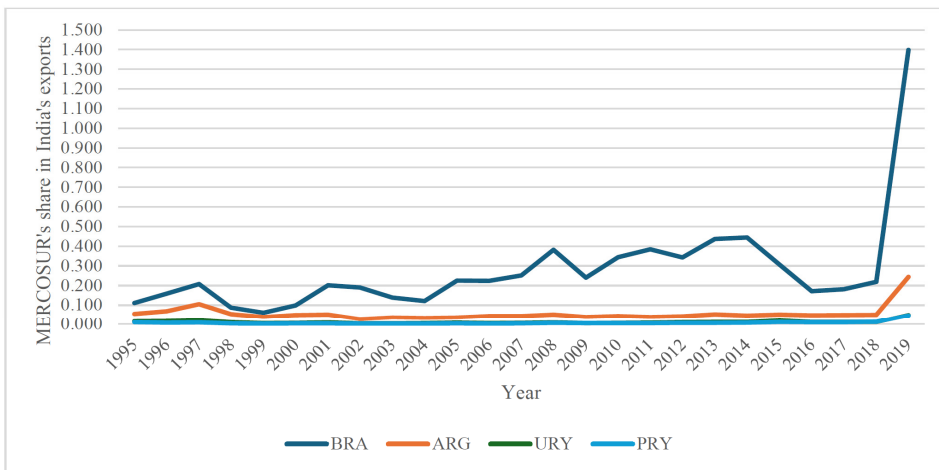
The negotiations on the Preferential Trade Agreement (PTA) between Mercosur and India concluded in March 2005 and entered into force in June 2009. The contracting parties of the agreement are - India, Brazil, Argentina, Uruguay, and Paraguay. The purpose of the agreement is to deepen the existing relationship between MERCOSUR countries and India and promote the growth of trade by granting reciprocal fixed tariff preferences followed by creation of free trade area between parties. The agreement consists of 18 chapters, 35 articles and 5 annexures<sup>1</sup>). Chapter 2 discusses trade liberalization strategies, where preferential duty is given to 452 Indian products entering MERCOSUR (10% for 394 products, 20% for 45 products and 100% for 13 products) and reciprocal concession to 450 MERCOSUR products entering India (10% for 93 products, 20% for 336 products and 100% for 21 products).

India and MERCOSUR are not similar in their economic conditions. On one hand, the India has registered high economic growth rates. On the other hand, the MERCOSUR countries have shown more volatility and fluctuations. In 2020, the combined GDP of the four MERCOSUR countries was \$1.9 trillion with a total market of 295 million people. Currently, India is fifth largest economy in terms of GDP and account for 18% of world population. As far as bilateral trade between India and MERCOSUR countries is concerned, trade growth is far away from the potential. Figure 1 depicts the contribution of MERCOSUR countries in India's export, and it is clear from the figure that India's major export destination is Brazil. The share of Argentina, Paraguay and Uruguay in India's export is negligible. The export share of MERCOSUR countries in the Indian merchandise exports has increased by 11 percent, 26.6 percent, 28.5%, 17% and 0.5% during 1996-2000, 2001-2005, 2006-2010, 2011-2015, and 2016-2019, respectively (see Figure 2). As growth of India's exports to MERCOSUR countries has decreased drastically after the introduction of India-MERCOSUR PTA. In terms of country-wise export growth, the average growth of India's exports to Brazil, Argentina, Uruguay, and Paraguay is 22.8%, 13.8%, 15%, and 15.3% during 1996-2019, respectively. Thus, the India's export growth over the years 1996-2019 is seen the highest for Brazil and the lowest for Argentina. In case of imports, Brazil and Argentina are having fair share in India's imports (as seen in Figure 3). While India's imports

1) For more details, please refer to <https://wits.worldbank.org/GPTAD/PDF/archive/india-mercosur.pdf>

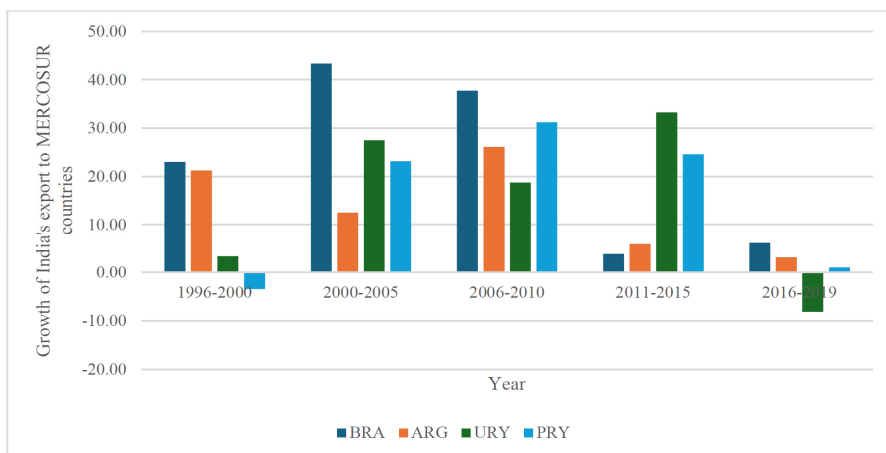
from Paraguay and Uruguay is almost insignificant. The import share of MERCOSUR countries in the Indian merchandise imports has increased by 45%, 108.8%, 80.49 %, 64.53%, and 0.58 % during 1996-2000, 2001-2005, 2006-2010, 2011-2015, and 2016-2019, respectively (see Figure 4). Like export growth, growth of India’s imports from MERCOSUR countries has also declined once PTA between them came into force. In terms of countries wise import growth, the average growth of India’s imports from Brazil, Argentina, Uruguay, and Paraguay is 18.7%, 18.47%, 19.83%, and 182.64 % during 1996-2019, respectively. Therefore, the India’s import growth over the years 1996-2019 is seen the highest for Paraguay and the lowest for Argentina.

**Figure 1.** Share of MERCOSUR countries in India's exports



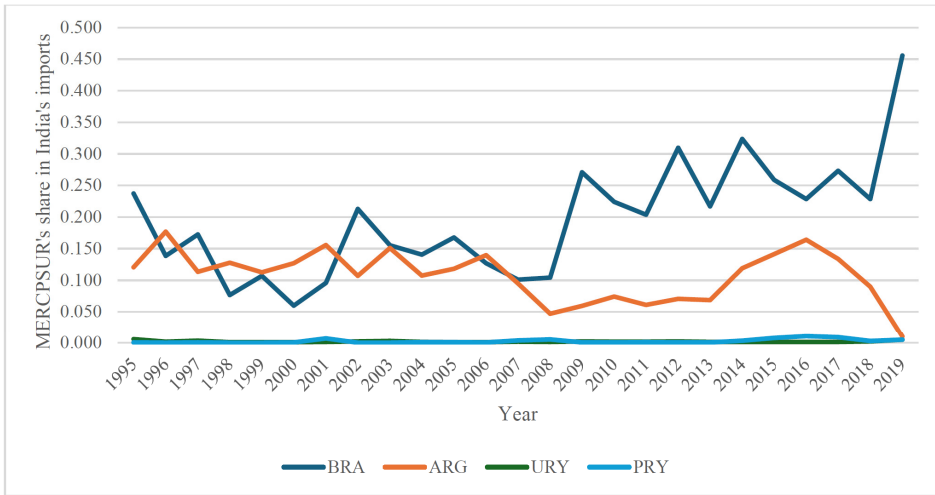
(Source) Author’s own elaboration based on ITPD-E Version 2.

**Figure 2.** Growth of India’s export to MERCOSUR countries



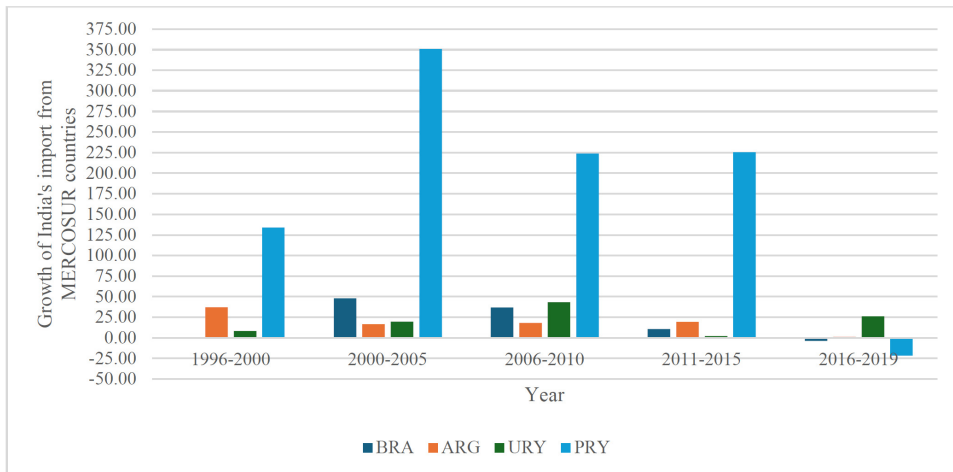
(Source) Author’s own elaboration based on ITPD-E Version 2.

**Figure 3.** Share of MERCOSUR countries in India's imports



(Source) Author's own elaboration based on ITPD-E Version 2.

**Figure 4.** India's import growth from MERCOSUR countries



(Source) Author's own elaboration based on ITPD-E Version 2.

Comparing the value of India's exports to and imports from MERCOSUR countries, it is depicted that India's exports to MERCOSUR is higher in value as compared to MERCOSUR's exports to India. Therefore, despite having full potential to benefit, the possible benefits from the agreement could not be reaped owing to higher trade costs.

The literature concerning the trade impact of India-MERCOSUR trade agreement is scanty. The effects of India-MERCOSUR have been relatively less explored in comparison to other

FTAs signed by India, such as ASEAN, SAFTA, BIMSTEC (Bhattacharya & Mandal, 2016; Jagdambe & Kannan, 2020; Jain, 2019; Kabir & Salim, 2011) and India's bilateral free trade agreements with Sri Lanka, Japan, Bhutan, Mauritius (Gaurav & Bharti, 2019; Khalid & Ismail, 2020; Pal & Pohit, 2020; Sikdar, 2010), and even some potential FTAs that are likely to be signed, like with European Union, China, Canada, RCEP, GCC, CPTPP (Agarwal & Ghosh, 2011; Ismail & Ahmed, 2019; Kaliranjan & Paudel, 2015; Khorana et al., 2018; Loganathan, Karakunnel, & Victor, 2021; Roy & Mathur, 2016; Sharma, 2014; Singh & Singh, 2020). Moreover, there is not a single study, which analyzes the comprehensive effects of India-MERCOSUR agreement. In other words, the specific effects of India-MERCOSUR PTA on each member's trade, distinguished by trade partner and direction of the trade, has not been assessed yet.

Therefore, the present study intends to evaluate the overall as well as comprehensive trade effects of India-MERCOSUR PTA using theoretical consistent structural gravity estimation technique (Larch, Wanner, & Yotov, 2018; Yotov et al., 2016). To be specific, the study focuses on the differential effects of concerned PTA on India's trade with MERCOSUR members and non-members, along with heterogeneous effects across members. In this way, the study has significant contributions to the economic integration literature in general and India-MERCOSUR literature in particular. This study could be a methodological improvement to all existing literature or studies with respect to ex-post analysis of India-MERCOSUR trade bloc under gravity model approach. Moreover, the present study has attempted to fill the gap on evaluation of comprehensive effects of India-MERCOSUR trade bloc. This study would serve as a benchmark study to evaluate the impact of India-MERCOSUR trade bloc on trade.

The rest of the paper is organized as follows. Section 2 discusses theoretical framework and recent economic integration literature along with specific studies related to India-MERCOSUR PTA. Section 3 explains data used and methodology applied for this research. Section 4 analyzes the findings of the study. Section 5 offers conclusion, policy implications, and scope for future research.

## **II. Theoretical Framework and Literature Review**

Theoretical foundation of trade agreements can be studied in terms of its partial equilibrium effects and general equilibrium effects. The partial equilibrium effect can be evaluated based on Vinerian dichotomy of trade creation and trade diversion. In the customs union theory proposed by Viner (1950), it is argued that the effects of trade agreements, particularly customs union, can be analysed based on trade creation and trade diversion effects. In trade-creation, less cost-efficient domestic production shifts to more cost-efficient producers from member countries. This leads to emergence of efficient trade patterns, benefitting producers and

consumers both. This allows consumers access to more goods at a lower price, on the one hand. On the other hand, producers began to export to member countries because of low tariffs. There is possibility of trade-diversion after the implementation of trade agreements. In trade diversion, low cost-efficient production from outside the trade agreements moves to high-cost imports from member countries. This leads to emergence of inefficient trade patterns by imposing costs on consumers. Viner (1950) initially introduced the concept for evaluating the effects of creating customs union. However, Plummer, Cheong, and Hamanaka (2010) confirmed that theory of customs union could equally be applied for analysing the effects of free trade agreements.

On the other hand, the general equilibrium framework provides more in-depth trade effects of PTAs. General Equilibrium (GE) effects capture the impact of PTAs on global matrix of relative trade costs between country pairs and the prices faced by exporters and importers in any country. Typically, a PTA will reduce trade cost between signing parties and possibly increase the relative trade cost of the signing countries vis-à-vis third countries. GE effects focused on the third-country effects, which depends on the depth of the agreement as well as the provisions contained in the agreements. Deep agreements lead to more trade creation and less trade diversion than shallow agreements. If provisions are purely discriminatory, will reduce trade costs between members and increase trade costs to non-members. If provisions do not discriminate between members and non-members of a PTA, it will reduce trade costs for both members and non-members. The present study focuses on partial equilibrium effects of India-MERCOSUR PTA adopting Vinerian theory of customs union. It analyses the fact that whether India-MERCOSUR PTA enhance international trade (trade creation), or it impinges on international trade (trade diversion).

Numerous literature is available concerning the impact assessment of economic integration agreements, namely FTAs, RTAs, and Customs Unions. Both ex-ante and ex-post studies are available. The ex-post studies assess the impact of economic integration agreement once the agreement is implemented, while using gravity model and several trade indices. Some of the example of ex-post studies are: Baier, Yotov, and Zylkin (2019), Baier and Bergstrand (2007), Bergstrand, Larch, and Yotov (2015), Ejones, Agbola, and Mahmood (2021), Larch, Wanner and Yotov (2018), Larch, Schmeißer and Wanner (2021), and Yotov et al. (2016). On the other hand, ex-ante studies examine the potential impact of agreements, which are likely to be signed in near future. These types of studies mainly use CGE modelling, SMART and GTAP models (Francois & Wignaraja, 2008; Khorana & Narayanan, 2017).

Under the vast literature on economic integration, some studies have focused on India's economic integration arrangements. There are some studies, which has critically analyzed India's economic integration efforts from different perspectives. Pant and Sadhukhan (2009) have studied whether the formation of RTAs (ASEAN, EU, NAFTA, and MERCOSUR) has hindered India's exports to these RTAs or not. They have found that India's exports seem to be affected

by demand side factors. Moreover, Pant and Paul (2018) suggested that India's RTAs lead to boost trade when the trading partners are already sharing great trade volume. Farasat (2008) has analyzed consistency of India's RTAs with WTO multilateralism policy and found lack of consistency. The paper has suggested further changes to India's trade policy. Jha (2013) further explored the benefits of RTAs signed by India to traders and based on primary survey it is found that India's RTAs have been less utilized and exploited as compared to GSP. Some studies have discussed the consequences of joining RCEP by India under the purview of new FTA strategy (Singh, 2023). Goyal (2021) reviewed India's trade agreements and argued for the need to include robust mechanism to deal with technology uncertainty under bilateral trade agreements. Katti (2012) compared the trend between bilateralism and multilateralism in Indian context since 1999-2009. The study provides several possible modifications in India's PTAs in the context of WTO. Seshadri (2009) analyzed India's changing strategy towards regional trade arrangements and suggested measures to enter into more balanced and agreements in future.

Reviewing of empirical literature concerning India's different levels of trade agreements suggests that most of the studies have focused mainly on regional trade agreements, like SAFTA and ASEAN. In case of studying the impact assessment of SAFTA, there are studies ranging from general impact of SAFTA on all its member countries to India-specific trade impact of SAFTA (Islam, Bloch, & Salim, 2014; Islam, Salim, & Bloch, 2016; Jain, 2019; Kumar & Ahmed, 2015; Nawaz, 2020; Ramakrishnan & Varma, 2014). Most of these studies have found that SAFTA has not been very effective for member states, despite having lots of potential. Moreover, there are numerous empirical and analytical studies analyzing the impact of ASEAN-India FTA (Bhattacharya & Mandal, 2016; Jagdambe & Kannan, 2020; Nambiar & Balasubramanian, 2016; Ratna & Kallummal, 2013; Sikdar & Nag, 2020; Singh, 2021). These studies have not only focused on trade impact, but also on income and employment impact of India-ASEAN FTA. Apart from these studies, there are studies focusing on India's bilateral trade agreements with Japan, Sri Lanka, Bhutan, and Mauritius (Gaurav & Bharti, 2019; Khalid & Ismail, 2020; Pal & Pohit, 2020; Sikdar, 2010). These studies have provided mixed evidence on trade enhancing or trade reducing impact of such agreements.

There are studies that have focused on several FTAs of India simultaneously (Aggarwal & Chakraborty, 2017; Bandolkar & Sudarshan, 2023; Kathjoo & Fazil, 2022; Kumar & Prabhakar, 2017; Ramakrishnan & Varma, 2014; Varma & Ramakrishnan, 2014). Ramakrishnan and Varma (2014) have explored the role of selected FTAs of India, viz., ASEAN FTA, SAFTA, and India-Sri Lanka FTA in promoting intra-industry trade. On the other hand, Varma and Ramakrishnan (2014) have focused especially on the impact of India's FTAs (SAFTA and ASEAN) on intra-industry trade in agri-food products. Kumar and Prabhakar (2017) investigated the impact of India's bilateral FTAs, FTA with ASEAN and SAFTA on export and import efficiency. Bandolkar and Sudarshan (2023) explored the role of India's RTAs (India-Thailand FTA, India-Singapore

CECA, and India-Sri Lanka FTA) in improving agricultural export competitiveness. Besides, Aggarwal and Chakraborty (2017) have found insignificant impact of India's preferential trade agreements on its bilateral intra-industry trade. One recent study by Kathjoo and Fazil (2022) have examined the impact of India's several RTAs and globalization on international trade among India and other trading partners by utilizing structural gravity model. The results suggested that RTAs are having significant impact on promoting trade among these countries.

Apart from these studies, the likely impact of prospective trade agreements between India and partner countries have also been analyzed in some studies. There are studies, which examines the potential role of India-China FTA for their growth (Agarwal & Ghosh, 2011; Kaliranjan & Paudel, 2015; Sharma, 2014; Wignaraja, 2014). Some of studies have also explored the potential impact of India-EU trade integration (Loganathan, Karakunnel, & Victor, 2021; Roy & Mathur, 2016). Likewise, there are few studies concerning the outlook of India-Canada FTA (Dobson, 2011), India's involvement in Regional Comprehensive Economic Partnership (RCEP), Gulf Cooperation Council (GCC), and Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) (Ismail & Ahmed, 2019; Li & Whalley, 2021; Singh & Singh, 2020).

As per author's knowledge, only two empirical studies are found assessing the impact of India-MERCOSUR PTA from India's perspective explicitly (Kaushal, 2021, 2022). Kaushal (2021) studied the impact of India's selected trade agreements (bilateral, SAFTA, APTA, ASEAN and MERCOSUR), regulatory quality and FDI inflow on India's export efficiency for the period 2002-2018. Applying stochastic frontier gravity model, the study has found that all trade agreements have boosted India's export efficiency except India-MERCOSUR PTA. Another similar study by Kaushal (2022) investigated the impact of India's selected RTAs, like bilateral, SAFTA, APTA, ASEAN and MERCOSUR trade bloc and regulatory quality on India's export efficiency. Based on the estimations from stochastic frontier gravity model, the study suggests that FTAs (like ASEAN and SAFTA) and bilateral agreements have improved India's exports efficiency to its trading partners more as compared to PTAs (MERCOSUR & APTA).

Provided the literature survey, it can be concluded that there is not a single study, which has focused solely on India-MERCOSUR trade bloc. Moreover, a comprehensive impact analysis of India-MERCOSUR PTA has not been conducted yet. With reference to this, the present study aims to examine the heterogenous and deeper impact of India-MERCOSUR PTA on member countries' trade growth.



### III. Methodology and Data

#### A. Model specification

To assess the trade impact of India-MERCOSUR PTA, the study utilizes structural gravity model. Gravity model is also considered as workhorse of international trade analysis. The reasons behind success of gravity model are - intuitive in nature, flexible structure, solid theoretical foundations, and represent realistic general equilibrium environment. In economic integration literature, significance of gravity model is proven. There are several studies, which have applied gravity model in different contexts (Francois & Wignaraja, 2008; Jagdambe & Kannan, 2020; Kaliranjana & Paudel, 2015; Kathjoo & Fazili, 2022; Kaushal, 2021, 2022; Kumar & Prabhakar, 2017; Loganathan, Karakunnel, & Victor, 2021; Martinzen-Zarzoso, 2003; Ramakrishan & Varma, 2014; Roy & Chatterjee, 2013; Singh, 2021).

Gravity model is originally being used to predict the bilateral trade flows between two countries. The basic form of gravity model tends to predict trade flows between two countries depending on countries' income level and trade costs (Tinbergen, 1962). Further, several studies have provided theoretical justification for the gravity model (Anderson & van Wincoop, 2003; Bergstrand, 1985; Eaton & Kortum, 2002). However, several econometric challenges to estimate gravity model have been encountered. The major challenges include - controlling multilateral resistances, presence of zero trade flows, problem of heteroscedasticity, controlling bilateral trade costs, endogeneity of trade policy, and estimating effects of non-discriminatory trade policy. Following best practices, a theoretically consistent structural gravity model has been specified.

Following Yotov et al. (2016), the study employs following structural gravity specification to estimate the bilateral trade effect of India-MERCOSUR PTA.

$$X_{ijt} = \exp(\pi_{it} + \chi_{jt} + \mu_{ij} + \beta_1 PTA_{ijt} + \beta_2 WTO_{ijt} + \beta_3 India - MERCOSUR_{ijt}) \times \epsilon_{ijt} \quad (1)$$

In equation (1),  $X_{ijt}$  is the value of trade flows between exporter country  $i$  and importer country  $j$  at time  $t$ . It includes both international and intra-national trade flows.  $\pi_{it}$  and  $\chi_{jt}$  are time-varying exporter and importer fixed effects, which accounts for outward and inward multilateral resistance, respectively. The equation also includes country-pair fixed effects  $\mu_{ij}$ , which absorb all time-invariant bilateral determinants of trade costs. It also controls the potential endogeneity issue of an FTA (Baier & Bergstrand, 2007). Time-varying bilateral trade cost variable, such as  $PTA_{ijt}$ , a dummy variable equal to one if  $i$  and  $j$  are the parties of same RTA, excluding India-MERCOSUR PTA, and zero otherwise, are also included. Considering

the possibility of trade impact of WTO membership (Felbermayr et al., 2024), WTO membership dummy ( $WTO_{ijt}$ ) has been included in the model. It is a dummy variable that takes the value to one if both  $i$  and  $j$  (with  $i \neq j$ ) are members of the WTO during period  $t$ , and zero otherwise. The main variable of interest is,  $India - MERCOSUR_{ijt}$  which takes the value of one if exporter country  $i$  and importer country  $j$  are members of the India-MERCOSUR PTA during and after India-MERCOSUR PTA came into force, and zero otherwise. The coefficients of  $India - MERCOSUR_{ijt}$  variable can be interpreted as partial equilibrium effect of India-MERCOSUR PTA on bilateral trade flows. This captures the increase in trade between India and MERCOSUR resulting from forming PTA. Furthermore, specification adds interaction between international border dummy and time effects to accounts for trend in trade costs over time (Bergstrand, Larch, & Yotov, 2015).

Apart from estimating aggregate impact of India-MERCOSUR PTA, the study has focused on identifying the heterogenous effects of the India-MERCOSUR PTA by

- (a) including separate indicators for India's exports and imports to and from MERCOSUR from 2009 (MERCOSUR→India; India→MERCOSUR). This enables us to capture trade-creating effects via exports from India to MERCOSUR and imports of India from MERCOSUR countries. The related coefficients capture change in exports and imports between India and MERCOSUR countries resulting from forming a trade integration agreement.
- b) adding indicators for India's exports and imports with non-MERCOSUR countries from 2009 (India↔ nonMERCOSUR). This captures trade-diverting effects via exports and imports of India with the ROW countries. The related coefficient captures the change in India's exports and imports from the ROW because of formation of PTA.
- c) allowing India-MERCOSUR PTA effect to differ for every MERCOSUR partner.

Following Baier, Yotov, and Zylkin (2019), the study has attempted to breakdown the overall impact of India-MERCOSUR PTA by trade directions and trade partners. To identify heterogeneous effects of India-MERCOSUR across members 8 new dummy variables have been generated and added in the baseline specification, as represented in equation 2. Each dummy variable present export and import flows between India and MERCOSUR countries. For example, a dummy of exports from India to Brazil takes the value one if India is exporter and Brazil is importer country during and after India-MERCOSUR PTA came into force, and 0 otherwise.

$$\begin{aligned}
 X_{ijt} = \exp & \left( \pi_{it} + \chi_{jt} + \mu_{ij} + \beta_1 PTA_{ijt} + \beta_2 WTO_{ijt} + \beta_3 India - Brazil_{ijt} \right. \\
 & + \beta_4 India - Argentina_{ijt} + \beta_5 India - Paraguay_{ijt} + \beta_6 India - Uruguay_{ijt} \\
 & + \beta_7 Brazil - India_{ijt} + \beta_8 Argentina - India_{ijt} + \beta_9 Paraguay - India_{ijt} \\
 & \left. + \beta_{10} Uruguay - India_{ijt} \right) \times \epsilon_{ijt}
 \end{aligned} \tag{2}$$

All the estimations have been performed using the Poisson pseudo-maximum likelihood (PPML) method (Santos Silva & Tenreyro, 2022; Yotov et al., 2016). This method estimates the gravity model in its multiplicative form and is being used widely in the context of gravity model, as it solves the challenge of including zero trade flows and more robust to the heteroskedasticity of data often found in trade observations (Santos Silva & Tenreyro, 2022), unlike traditional OLS estimates.

## B. Variables and their sources

For empirical analysis, the study employs data collected and calculated by Rojas Rodríguez and Matschke (2023), who have used three different trade datasets consisting of three alternative proxies for intranational trade, for the estimation of average trade effects of India-MERCOSUR PTA. The reason behind using three different intranational trade proxy dataset is that the available source of information for intranational trade data is inconsistent after 2015. Therefore, they have collected and calculated intranational trade flows from different sources and added to international trade observations taken from the ITPD-E ver. 2 (Borchert et al., 2022).

One dataset uses data from FAO and UNIDO to calculate intranational trade flows. Second one includes intranational trade flows directly taken from the ITPD-E Version 2 database (July 2022). Third dataset includes intranational trade flows calculated by a country's GDP minus the sum of its exports<sup>2</sup>). For collecting data on traditional gravity variables, such as bilateral distance, common colony, common colonizer, common language, existing FTAs among members, GDP of exporter and importer countries, Dynamic Gravity Dataset (DGD) has been employed (Gurevich & Herman, 2018).

The data applied is aggregated trade data of agriculture, manufacturing, and mining & energy, which seems consistent with the major focus of the paper, i.e., looking at the effects of India-MERCOSUR PTA on goods trade. Moreover, the data coverage of 1995-2019 is large enough to obtain representative effects of the agreement. It gives large variability to estimate the effects of India-MERCOSUR PTA, which came into force in 2009.

Our sample thus includes observations of 209<sup>3</sup>) countries between 1995 and 2019. Therefore, the total 209 exporters  $\times$  209 importers  $\times$  25 years = 1,092,025 observations. Any missing international trade observations were assumed to be zero, except in cases in which a country is not present in the Dynamic Gravity Dataset for a given year. On the other hand, missing intranational trade data remain missing. Table 1 provides descriptive statistics of variables used in the analysis.

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2) For more details, please refer to Rojas Rodríguez, J. R., & Matschke, X. (2023). The CAFTA-DR Free Trade Agreement—Analyzing its effects in a modern gravity framework. *International Economics and Economic Policy*, 20(1), 27-93.

3) List of countries studied is provided in the Online Appendix Table A1.

**Table 1.** *Descriptive Statistics*

Variables	Observations	Missing Values	Mean	Std. Dev.	Min	Max
International trade	1,053,484	33,316	278.6159	3775.119	0	5.56E+05
Intranational trade (ITPD-E)	3,846	1,379	116468.3	678876.6	0.005	1.61E+07
Intranational trade (UNIDO/FAO)	3,883	1,342	155407.1	870607.8	0.012677	1.67E+07
Intranational trade (GDP-exports)	4,507	718	227874.5	1099216	0.467619	1.89E+07
Distance	1,048,365	43,660	8213.358	4638.183	1	19746.33
Common Border	1,058,709	33,316	0.014376	0.1190351	0	1
Common Language	1,058,709	33,316	0.354197	0.4782696	0	1
Common Colony	1,058,628	33,316	0.010251	0.100727	0	1
Common Colonizer	1,058,709	33,316	0.073267	0.2605737	0	1
GDP	959,519	132,506	281935.5	1233728	11.02595	2.05E+07
Population	844,151	247,874	37.11462	136.6201	0.004376	1409.517
WTO membership	1,058,709	33,316	0.500886	0.4999995	0	1
PTA	1,058,628	33,397	0.156236	0.3630793	0	1
India-MERCOSUR PTA	1,092,025	0	8.06E-05	0.0089765	0	1

(Source) The Author

*Note.* International and intranational trade data are in million US dollars. Distance data is in population weighted km; GDP is in million US dollars; Common border, common language, common colony, common colonizer, WTO membership, PTA and India-MERCOSUR PTA are dummy variables equal to 0 or 1. Total sample is sum of observations and missing values.

## IV. Empirical Findings

This section presents empirical estimations based on the models specified above. Firstly, total trade effects of India-MERCOSUR PTA have been presented. Secondly, heterogenous effects of India-MERCOSUR PTA on trade across members have been estimated and presented. Lastly, the robustness of the PTA effects has been investigated by considering different alternative specifications.

### A. Total effects of India-MERCOSUR PTA on member countries' trade

Table 2 presents the results for the aggregated effect of India-MERCOSUR PTA. To compare the impact of differences in intranational trade flows on estimations, datasets containing all three intranational trade proxies are used. The results of our main specification (equation 1) are presented in columns 1 to 3 of Table 2. The results for the dataset, which calculates intranational trade data from UNIDO and FAO, are presented in column (1). Column (2) presents results from the dataset, which takes intranational trade flows directly from ITPD-E Ver. 2 database. The results for another dataset calculating intranational trade flows by subtracting

a country's exports from its GDP, are presented in column (3) of Table 2. As is clear from Table 2, the coefficient estimates vary for different datasets, which verifies the differential impact of three alternative intranational trade proxies on estimated coefficients. The coefficient of PTA remains insignificant in all three cases. The plausible explanation for getting insignificant effect of PTA would be the inclusion of interaction between international border dummy and year effects, which absorb much of the time variation in the data, and lead to smaller and often insignificant estimate of trade policy variable, like PTA. Further, the coefficient estimates of WTO vary in three different cases. In case of calculation of intranational trade flows data from GDP and exports, the coefficient is significant with positive sign. While, in case of taking intranational trade data from ITPD-E database, the coefficient remains significant, however, with negative sign. This result seems inconsistent with estimates from Felbermayr et al. (2024). On the other hand, when intranational trade data is calculated from UNIDO and FAO source, the estimation for WTO becomes insignificant. Moreover, the effects of India-MERCOSUR are positive and significant in all three columns, however, with different magnitude. The magnitude is the highest in column (3), followed by column (1) and column (2). The positive effects can be interpreted as the presence of India-MERCOSUR PTA leads to improvement in bilateral trade between member countries. To be specific, the establishment of PTA leads to more bilateral trade ranging from 35% to 87% between member countries at the expense of domestic sales<sup>4</sup>). The results establish true Vinerian trade effects in case of India-MERCOSUR PTA. Since, there have been no studies that have employed structural gravity model to estimate the trade impact of India-MERCOSUR PTA, it seems difficult to compare the results of present studies. Kaushal (2021) evaluated the impact of FTAs including India-MERCOSUR PTA on India's export efficiency using stochastic frontier gravity specification for the period 2002-2018 and found that India-MERCOSUR PTA do not enhance export efficiency. In contrast, another study (Kaushal, 2022) utilizing the similar method used by Kaushal (2021) has found the positive impact of India-MERCOSUR PTA on India's export efficiency during 2008-2018. Therefore, the present study's finding of trade creation effects for India-MERCOSUR PTA cannot be compared with the results of Kaushal (2022) and Kaushal (2021) quantitatively as well as qualitatively owing to differences in the methodological approach. The stochastic frontier gravity model is an integration of traditional gravity model with stochastic frontier analysis to evaluate trade efficiency against the trade potential (Kaliranjan, 2007). While a theoretically grounded structural gravity model is being used to assess the effects of trade policy in a multi-country environment (Yotov et al., 2016).

Among the three alternative datasets calculating intranational trade flows in three different ways, our preferred benchmark estimation is one where intranational trade flows are taken from UNIDO and FAO datasets. The reason is that other two ways of calculating intranational trade

4) The effects are calculated as:  $[\exp(0.626)-1] \times 100$ ;  $[\exp(0.300)-1] \times 100$ ;  $[\exp(0.489)-1] \times 100$

are likely leading to bias in the coefficient estimates (Rojas Rodríguez & Matschke, 2023). Therefore, the dataset that has been used for further analysis is the data where intranational trade is calculated from UNIDO and FAO.

**Table 2.** *Main Results*

	Dependent Variable: Trade Flows				
	(1)	(2)	(3)	(4)	(5)
PTA <sub>ijt</sub>	0.019 (0.034)	0.066 (0.068)	0.058 (0.035)	0.019 (0.034)	0.022 (0.034)
WTO <sub>ijt</sub>	-0.018 (0.073)	-0.144** (0.073)	0.226** (0.106)	-0.018 (0.073)	-0.014 (0.073)
India ↔MERCOSUR <sub>ijt</sub>	0.489*** (0.047)	0.300*** (0.067)	0.626*** (0.054)		0.858*** (0.092)
MERCOSUR→India <sub>ijt</sub>				0.460*** (0.169)	
India→MERCOSUR <sub>ijt</sub>				0.516** (0.222)	
India↔ nonMERCOSUR <sub>ijt</sub>					0.642*** (0.132)
Constant	12.616*** (0.018)	12.313*** (0.041)	13.326*** (0.017)	12.616*** (0.018)	12.602*** (0.018)
No. of Observations	949838	946673	950870	949838	949838

(Source) The Author

*Notes.* All estimations include exporter-time, importer-time, and country-pair fixed effects. Coefficient estimates for fixed effects, international border \* year are omitted for brevity. Standard errors are multi-clustered by exporter, importer, and year and reported in parentheses. \*p <0.1, \*\*p <0.05, \*\*\*p <0.01. PTA, Preferential trade agreement; WTO, World Trade Organization; MERCOSUR, Spanish abbreviation for South American trade bloc. A complete version of the table without the fixed effect coefficients is available upon request.

Column 4 of Table 2 shows the possible heterogeneity of effects of the India-MERCOSUR PTA in terms of trade flows type, that is, for India's exports to MERCOSUR countries and India's imports from MERCOSUR countries. The estimations indicate that while the India-MERCOSUR PTA has increased India's exports to MERCOSUR countries (or say MERCOSUR's imports from India) by 67.5 per cent, India's imports from MERCOSUR countries (or say MERCOSUR exports to India) have risen by 58.4 per cent. The results indicate that the preferential trade agreement has increased both exports and imports between India and MERCOSUR countries. Moreover, the study further explores the possibility that whether PTA has increased the trade between India and MERCOSUR members at the cost of trade diversion away from trade between India and non-MERCOSUR countries. The results have been estimated in column (5) of Table 2, where a dummy variable representing India's trade flows with non-MERCOSUR countries after 2009 has been added. The coefficient estimates suggest that India-MERCOSUR PTA has led to increase in India's trade with non-MERCOSUR countries by 90%. Further,

our estimates reveal that controlling for the unilateral India-MERCOSUR PTA effects seems essential for the quantification of the bilateral trade effect. To be specific, accounting for unilateral effects of India-MERCOSUR PTA additionally rises the estimated bilateral PTA membership effect to 136 percent, which is also consistent with the estimates by Larch, Wanner, and Yotov (2018).

To conclude, India-MERCOSUR PTA seems to have increased India's trade with non-MERCOSUR countries, as well as with fellow MERCOSUR members.

## B. Heterogeneous effects of India-MERCOSUR PTA across members

The study further captures the possibility that many variations can be found in case of each member countries' exports and imports, that was missed when looking solely at the average India-MERCOSUR effect. Table 3 analyses the heterogeneity in the effects of the India-MERCOSUR PTA across exports and imports of each MERCOSUR member. For aggregate goods trade flows, it is found that every country pairs the India-MERCOSUR PTA has significantly increased trade flows. The biggest effects of India-MERCOSUR PTA are found for trade between India and Paraguay, Uruguay, and Brazil, while the impact is the lowest for India's trading partners Argentina and Uruguay. To be precise, India's exports to Argentina, Brazil, Paraguay, and Uruguay have increased by 59%, 150%, 254%, and 234%, respectively, owing to the introduction of India-MERCOSUR PTA. Whereas, once PTA came into force, India's imports from Argentina, Brazil, Paraguay, and Uruguay have increased by 50%, 206%, 140% and 87%, respectively. Besides the heterogeneity across member pairs, the results also indicate that within most pairs the trade effect is larger for Indian exports than for the exports of the respective MERCOSUR partner. Highly asymmetric impacts are found for India's trade with Uruguay. Brazil and Paraguay received higher amount of access to the Indian markets. While India received greater amount of market access to Paraguay and Uruguay markets. Therefore, heterogenous effects of India-MERCOSUR PTA across member states are proved.

**Table 3.** *Heterogeneous Effects of India-MERCOSUR PTA on Trade Across Members*

Dependent Variable: Trade flows	
	(1)
PTA <sub>ijt</sub>	0.022 (0.034)
WTO <sub>ijt</sub>	-0.014 (0.073)
India $\leftrightarrow$ nonMERCOSUR <sub>ijt</sub>	0.642*** (0.132)
India $\rightarrow$ Argentina <sub>ijt</sub>	0.465* (0.255)

**Table 3.** *Continued*

Dependent Variable: Trade flows	
	(1)
India→Brazil <sub>ijt</sub>	0.915*** (0.196)
India→Paraguay <sub>ijt</sub>	1.266*** (0.197)
India→Uruguay <sub>ijt</sub>	1.206*** (0.176)
Argentina→India <sub>ijt</sub>	0.406** (0.186)
Brazil→India <sub>ijt</sub>	1.119*** (0.103)
Paraguay→India <sub>ijt</sub>	0.876*** (0.242)
Uruguay→India <sub>ijt</sub>	0.625*** (0.187)
Constant	12.602*** (0.018)
No. of Observations	949838

(Source) The Author

*Notes.* This estimation includes exporter-time, importer-time, country-pair fixed effects, and international border  $\times$  year fixed effects. Coefficient estimates for fixed effects are omitted for brevity. Standard errors are multi-clustered by exporter, importer, and year, and reported in parentheses. \*p < 0.1, \*\*p < 0.05, \*\*\*p < 0.01. PTA, Preferential trade agreement; WTO, World Trade Organization; MERCOSUR, Spanish abbreviation for South American trade bloc. A complete version of the table without the fixed effect coefficients is available upon request.

### C. Robustness tests

The study examines the robustness of large and positive PTA effects by considering alternative specifications, as presented in Table 4. The robustness of basic results has been checked in several ways. First, the phasing-in effects of PTA has been controlled by including 5 years lagged values of PTA and India-MERCOSUR PTA, as suggested by Baier, Yotov, and Zylkin (2019) and Yotov et al. (2016). The results seem consistent with the baseline estimates, suggesting that there is no phasing-in effect of concerned PTA, as the coefficient of lagged variable remains insignificant (shown in column 1 of Table 4). Second, the strict endogeneity of PTA variables has also been tested by including 5 years lead value of PTA and India-MERCOSUR PTA in the model to estimate the future effect of such agreements on bilateral trade (as shown in column 2 of Table 4). Like the previous case, there is no change in the significance and sign of contemporaneous India-MERCOSUR PTA coefficient. Moreover, the coefficient of lead variable remains insignificant, suggesting that variables that measure the effects of India-MERCOSUR PTA are strictly exogenous, and that there are no signs of reverse causality in the model (Yotov et al., 2016). Third, the baseline specification has been estimated



with 3-year interval trade data to ensure that trade flows are being allowed to react to changes in trade policies (Yotov et al. 2016) and reported in column 3 of Table 4. The results remain close to the estimates in column 1 of Table 2. Fourth, the robustness of the results has been checked by excluding intranational trade flows, as this was the case with all the previous studies. Here, it is found that the exclusion of intranational trade flows does not alter the sign and significance of coefficient estimate, however, the magnitude of the effects becomes less (as shown in column 4 of Table 4). This suggests that exclusion of intranational trade flows might lead to downward biasedness in the results. Fifth, the baseline specification has been estimated using alternative to control for negative trend in trade costs over the time. The interaction terms between logarithm of distance and year effects have been added in place of interaction between international border dummy and year. As shown in column 5 of Table 4, the effect of India-MERCOSUR PTA remains significant with positive sign. Sixth, another alternative to account for trend in trade costs has been added in the baseline equation, i.e., interaction between each country pair fixed effects and time trend. In this case, the significance of coefficient estimates of India-MERCOSUR PTA becomes lost (shown in column 6 of Table 4), as these controls absorb much of the variation in PTA variables and leave very little variation for identifying their effects, or they are controlling something more than negative trade costs trend in the data (Larch, Schmeißer & Wanner, 2021). Seventh, the study estimates the baseline model without country-pair fixed effects. To account for unobservable time invariant trade costs components, traditional gravity variables like, distance, common border, common colony, common colonizer, and common language, have been included. The results of average India-MERCOSUR PTA effects retain its significance, however the sign changes from positive to negative (as shown in column 7 of Table 4), suggesting that exclusion of country-pair fixed effects failed to account for potential endogeneity of trade policy variable, thereby, leading to the underestimation of trade policy variables coefficient (Baier and Bergstrand, 2007; Felbermayr et al., 2015). To be precise, without eliminating the potential endogeneity of PTAs in the panel trade data, the coefficient of the variable RTA could be small (in fact negative) and not statistically significant (Yotov et al., 2016). Last, the estimates without controlling for multilateral resistance terms and country-pair fixed effects have been presented in column 8. The size variable (proxied by GDP) and population variables of exporter and importer country have been included in the model. The result is similar to the estimates in column 7, suggesting that the estimation might be biased and inconsistent without controlling MRTs and time-invarying determinants of trade costs.

**Table 4.** Robustness Test Results

	Dependent Variable: Trade FlowColumn1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PTA <sub>ijt</sub>	0.085** (0.040)	-0.039 (0.043)	0.028 (0.034)	0.048 (0.042)	0.010 (0.036)	0.052** (0.025)	0.274 (0.173)	0.199* (0.114)
PTA <sub>ij(t-5)</sub>	-0.097** (0.047)							
WTO <sub>ijt</sub>	-0.052 (0.073)	0.057 (0.062)	-0.065 (0.105)	0.083 (0.103)	0.048 (0.081)	0.068** (0.035)	0.234 (0.475)	-0.512 (0.317)
India $\leftrightarrow$ MERCOSUR <sub>ijt</sub>	0.391*** (0.070)	0.310*** (0.077)	0.587*** (0.077)	0.312*** (0.060)	0.484*** (0.043)	0.223 (0.212)	-1.018*** (0.135)	-1.158*** (0.225)
India $\leftrightarrow$ MERCOSUR <sub>ij(t-5)</sub>	0.042 (0.123)							
PTA <sub>ij(t+5)</sub>	0.020 (0.042)							
India $\leftrightarrow$ MERCOSUR <sub>ij(t+5)</sub>	0.298 (0.319)							
ln(distance) <sub>ij</sub>							-0.626*** (0.220)	-0.606*** (0.113)
Common Border <sub>ij</sub>							0.476* (0.254)	0.519* (0.266)
Common Colony <sub>ij</sub>							0.274 (0.183)	0.146 (0.255)
Common Colonizer <sub>ij</sub>							0.348* (0.208)	0.229*** (0.085)
Common Language <sub>ij</sub>							0.225* (0.125)	0.118 (0.101)
ln(GDP) <sub>it</sub>							0.595*** (0.056)	
ln(GDP) <sub>iet</sub>							0.646*** (0.030)	
l(Population) <sub>it</sub>							0.310*** (0.078)	
ln(Population) <sub>it</sub>							0.225*** (0.043)	
No. of Observations	753124	737180	247219	942827	947905	949839	1040729	665693
3-year interval	No	No	Yes	No	No	No	No	No
Exporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Importer-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Country Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Intranational trade flows	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Trend	No	No	No	No	No	Yes	No	No
International border'year dummy	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Distance' year dummy	No	Yes	No	Yes	Yes	No	No	No

(Source) The Author

Notes. Coefficient estimates for fixed effects and constants are omitted for brevity. Standard errors are multi-clustered by exporter, importer, and year and reported in parentheses. \*p <0.1, \*\*p <0.05, \*\*\*p <0.01. PTA, Preferential trade agreement; WTO, World Trade Organization; MERCOSUR, Spanish abbreviation for South American trade bloc; GDP, Gross Domestic Product. A complete version of the table without the fixed effect coefficients is available upon request.

## V. Conclusion, Policy Implications and Scope for Future Research

India-MERCOSUR PTA has been formed to boost the regional cooperation India and Latin American countries. Provided with the strategic significance of this PTA for both the parties, there is an ongoing discussion to expand this agreement further. In such a situation, it seems imperative to see how successful this PTA has been in promoting trade flows between India and the MERCOSUR members. The study answers this question by employing the recent theoretical developments in the estimations of structural gravity model of trade. The study provides evidence that introduction of PTA leads to large, positive, and highly statistically significant partial trade effect. Such result can be interpreted as joining the PTA have led to an increase in international trade flows among members at the expense of domestic sales. Further, the study identifies unilateral country-specific PTA effects on trade between India and non-MERCOSUR countries. The study finds strong evidence that PTA membership leads to India's greater openness towards the non-MERCOSUR members. Besides, the heterogeneity in terms of the effects of the India-MERCOSUR PTA for each MERCOSUR member's exports and imports to and from India is established by the findings of the study. It is found that both India's exports to and imports from all MERCOSUR member countries are positively affected. These results depict that both India and MERCOSUR gained considerably from the PTA. Moreover, the finding of the study is robust to several modification in the baseline specifications, such as including lead and lagged values of PTA, exclusion of intranational trade, 3-year interval of data, alternative proxies to account for decreasing trade cost trend over time, not controlling multilateral resistance terms and trade costs adequately. Therefore, the study makes contribution to the existing trade agreements literature in general and India-MERCOSUR PTA literature in specific by offering robust support for significantly positive and large impact of India-MERCOSUR PTA on member's trade. It advocates that trade liberalization beyond mere RTA may be a worthy approach and other similar RTAs may think of strengthening their integration with the strategic trade partners.

The study offers some major policy implications to the government and policymakers of member countries of PTA. First, based on the findings of large average impact on goods trade, the study provides support for extending the existing liberalization policy to more goods, services, and investment. The extent of integration can be strengthened further by implementing trade facilitation measures, cutting unnecessary sensitive list products (as already initiated by both the parties), and cooperating at institutional level. MERCOSUR countries, mainly Brazil and Argentina may reduce NTMs imposed on India. The elimination of outright non-tariff barriers such as quotas and non-automatic licenses, and the advancement of regulatory collaboration and convergence is crucial for genuine market integration. Second, since the study provides evidence of heterogenous effects of PTA across member states, government and policy makers

of each member states can also make their efforts individually to promote their trade more with other member states. The members securing the major benefits may take more serious efforts to extend their trade liberalization, while the members getting the less benefits may need to look at their existing trade strategies and undertake any challenges they have found. Third, the study suggests mainly MERCOSUR block to open up signing new free trade agreement with other countries strategically to reap potential benefits from opening their markets to the world.

The present study can be extended in various directions. In future, it would be worthwhile to analyze bilateral trade effects of India-MERCOSUR PTA at disaggregated trade level, as this will capture the differential impact of introducing PTA on different industries. Furthermore, welfare impact of India-MERCOSUR PTA on its members can be estimated using general equilibrium model in future research.

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