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Firm-Specific Trade Effects of Economic Integration Agreements: Estimating Extensive and Intensive Margins of Trade

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Abstract

By utilizing panel statistics of 1520 country pairs and economic integration agreements (EIAs) from 2007 to 2017, this paper presents evidence of the effect of EIAs on export margins, i.e., both extensive (firms) and intensive margins (average exports per firm). In doing so, this work adds empirical support to the relevant literature on trade margins and sheds light on a new "firm" aspect of trade margins concerning EIAs. Estimating a structural gravity model with exporter-time, importer-time, and country-pair fixed effects reveals that EIAs primarily increase the average exports per firm but have a smaller impact on the number of exporting firms. It further examines whether different "types" of EIAs have different effects on these margins and uncovers that the higher the degrees of integration agreements, the stronger the impact on average exports per firm.

Keywords: Economic Integration Agreements, International Trade, Firm Margins, Extensive Margins, Intensive Margins

JEL Classifications: F1, F14, F15

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1. Introduction

"Economic integration," as an economic strategy, integrates a country's trade, monetary, and fiscal policies, and economic integration agreements (EIAs) can be categorized as one-way or two-way preferential trade agreements (PTAs), free trade agreements (FTAs), customs unions (CUs), common markets (CMs), and economic unions (EUs) based on the degree of integration. Numerous empirical studies have been done to understand the impact of integration on the aggregate level of trade with models that assume firms are homogeneous (Baier & Bergstrand, 2007; Baier et al., 2007; Bergstrand et al., 2015; Egger et al., 2011; Ilzkovitz et al., 2007; Rose & Honohan, 2001; Schott, 2004).

The new "new trade theory" is focused on two important arguments: (1) the existence of a fixed entry cost to enter the export market, and (2) differences in productivity level determine the status of the firm at any point in time: exporter or not (Alessandria et al., 2021; Arkolakis et al., 2012; Bernard et al., 2007; Chaney, 2008; Helpman et al., 2008; Melitz, 2003). In other words, firms are heterogeneous as they differ in costs, and the ones with lower costs can export while the ones with higher costs exit the market (Melitz & Ottaviano, 2008). Typically, there are two types of trade costs: (1) fixed costs and (2) variable costs. Since there is an ex-ante fixed cost associated with export, the number of exporting firms, referred to as the extensive margin, is affected by both the fixed and variable costs, while the intensive margin (average exports per firm) is only affected by the variable costs while exporting. Hence, aggregate export flows can be decomposed into (1) extensive margin (number of firms) and (2) intensive margin (average exports per firm) (Alessandria et al., 2021; Chaney, 2008; Helpman et al., 2008).

What happens to the extensive and intensive margins when countries integrate through EIAs? Economic integration liberalizes trade costs, thus, for existing exporting firms, there would be a greater reduction in marginal costs post-integration, which impacts the intensive margin as existing firms respond to falling trade costs (Arkolakis et al., 2012; Melitz & Trefler, 2012). Since existing exporters have already offset the fixed costs of exporting, a reduction in trade costs should allow them to expand the size of their exports, and the intensive margin should be adjusted. When trade costs fall, new firms enter the export market (Alessandria et al., 2021; Arkolakis et al., 2012; Chaney, 2008, p. 1708). Pre-integration, there is a certain threshold of marginal costs for firms that get reduced post-integration because of the tougher selection process (Melitz & Ottaviano, 2008, p. 300). Hence, the reduction in the cost threshold will motivate some new firms in favor of exporting. For new entrants, those who can produce within the new and decreased threshold level of marginal costs after integration will sustain while others exit (Melitz & Ottaviano, 2008; Melitz & Trefler, 2012). On the one hand, the impact of economic integration on the intensive margin can be realized in the short term, as existing exporters have already absorbed the fixed cost of exporting; only variable costs affect them. On the other hand, the impact on the extensive margin can be sought from a long-term perspective since new entrants need to incur both the ex-ante fixed costs of exporting and variable costs (Baier et al., 2014).

Forming EIAs may result in greater trade flows among member states because either existing firms increase the size of their exports in comparison to the pre-integration scenario (intensive margin) or new firms are entering the foreign market that have not exported before (extensive margin), or both. In the context of this paper, we are interested in examining the effect of Economic Integration Agreements (EIAs) on these two margins, and our theoretical motivations are drawn from the seminal contributions of

Melitz & Ottaviano, 2008 and Melitz & Trefler, 2012. Melitz & Ottaviano (2008) presented a theoretical model that is ideally adapted in this paper to analyze the economic integration scenarios in an environment with heterogeneous firms. In the model, firms are heterogeneous in terms of cost, and the model allows for different trade costs between any country pair, demonstrating that the effects of multilateral trade liberalization are very similar to those of full economic integration. The authors show that trade liberalization through integration can be of three types: (a) unilateral, (b) bilateral, and (c) preferential. Unilateral liberalization reduces competition in the liberalizing country, increasing the cost cut-off, whereas the liberalized country experiences the opposite. The cost cut-off there is lowered by increased competition; hence, it experiences an increase in the number of entrants. Increased competition in both markets because of bilateral liberalization causes proportional changes in cost cut-offs in the respective countries. This ensures welfare gains in both countries. Consider the simplest case of three countries and assume they are pair-wise symmetric in terms of trade barriers. Preferential liberalization refers to changes in trade barriers that are not proportional in these three nations. Two countries liberalize trade with each other while there are no changes in trade barriers with the third country. Preferential liberalization results in a decreased cost cut-off in liberalizing countries and an increased cut-off in the third country. As a result, average costs decline in liberalizing countries while increasing in third-world countries (Melitz & Ottaviano, 2008; Melitz & Trefler, 2012).

In the context of trade policy, a higher degree of integration, like a customs union or common market, is different from the other lower degrees of integration, like PTAs or FTAs. For example, PTAs can be one-way or two-way and eliminate the trade barriers partially; FTAs are two-way, and they eliminate the barriers fully. However, the customs union differentially reduces the tariff barriers to zero within member states with preferential tariffs and affects the tariff on imports from third countries through common external tariffs as well (Balassa, 2013; Frankel et al., 1997; Ilzkovitz et al., 2007). Furthermore, a common market aims at strengthening the internal market by allowing a free flow of four factors: goods, services, labor, and capital (Balassa, 2013; Ilzkovitz et al., 2007; Krueger, 1997, pp. 173-174). Beyond tangible goods, a common market broadens the scope of trade liberalization by encompassing all economic resources; as a result, tariff and non-tariff barriers are removed to allow the free movement of goods, services, labor, and capital. Finally, the economic union ensures that the member states unify their monetary, fiscal, and labor market policies together. Typically, the member states in the economic union form supranational institutions that legislate the rules of commerce for the member states, leaving the implementation to the respective national authorities; as a result, supranational commercial law replaces the national law of member states (Balassa, 2013; Ilzkovitz et al., 2007; Krueger, 1997; Soete & Van Hove, 2017). Importantly, CUs with a higher degree of integration, such as CM and EU, share a common link, i.e., one single external tariff for all goods and services imported from outside into the member countries with no import duties at the internal borders (Krueger, 1997, pp. 173-174). A summary of the varying degrees of economic integration agreements and their definitions are presented in Table 1.

Table 1: Different Types of Economic Integration Agreements

EIA Ranking	Type of Agreement	Type of Agreement (Abbreviation)	Definition
1	Non-Reciprocal Preferential Trade Agreement	NR-PTA	One member country grants preferential terms and customs advantages to another.
2	Preferential Trade Agreement	PTA	Members get preferential terms over non-members.
3	Free Trade Area	FTA	Members' trade restrictions are eliminated (or considerably reduced), and non-members are treated differently.
4	Customs Union	CU	Same as FTA, however, non-members are treated equally.
5	Common Market	CM	Same as CU, but with the addition of free movement of labor and capital.
6	Economic Union	EU	Same as CM, but also Co-ordination of Monetary and Fiscal Policy.

Source: (Frankel et al., 1997)

Existing literature on the impact of EIAs and trade margins is dominated by analysis of the effect on goods margins, and they outline that the effect of EIAs on intensive margins is greater than that of extensive margins, and varying degrees of integration have a differential impact on trade (goods) margins. The general finding of the existing literature is that economic integration affects trade margins differently, as the effect on intensive margins is higher. This supports the theoretical predictions that there is an entry cost to enter the export market; hence, the differential exists (Baier et al., 2014; Bensassi et al., 2012; Márquez-Ramos et al., 2015). Most existing studies on EIAs and the two margins do not focus on firm margins. The extensive margins can be of three types; (1) country, (2) firm, and (3) goods (Baier et al., 2014, p. 1). With a cross-country data set of 26 origin countries and their exports to 66 destinations between 2007 and 2017, the first objective of this paper is to examine the impact of EIAs on export (firm) margins. This would allow us to compare our findings on export (firm) margins to the existing literature on export (goods) margins.

Secondly, based on the degree of integration, we examine the effects of various types of EIAs – preferential trade agreements (PTA) [1], free trade agreements (FTA), and a variable for Customs Unions, Common Markets, and Economic Unions (CUCMEU) – on aggregate export flows, extensive margins, and intensive margins by employing a set of dummy variables. The closest to this paper is Baier et al. (2014), who examined the impact of different types of integration agreements on trade (goods) margins with large country pairs and suggest that a higher degree of EIA had a greater impact when compared with a lower degree of EIA on the margins of trade (Baier et al., 2014). We extend the works of Baier et al. (2014) and Márquez-Ramos et al. (2015) to firm margins

[1] As we have a smaller number of two-way PTAs, we combine both one-way and two-way PTA observations to form one dummy variable called PTA. The number of observations concerning different types of EIAs is presented in the appendix section.

of trade as we decompose the aggregate export flows into two parts; (i) an extensive margin (number of exporting firms) and (ii) an intensive margin (average exports per firm) and estimate the effects of EIAs on these margins and compare the findings with the effect on aggregate exports as well.

The following is the rest of this paper. The data sources and data description are mentioned in Section 2, and the decomposition of export margins is summarized in Section 3. Section 4 discusses our empirical methodology, which is based on the average treatment effects (ATE) model suggested by Baier and Bergstrand (2007) for estimating the effects of EIAs on export flows in structural gravity setups. The empirical findings are presented in Section 5, which is followed by the conclusion in Section 6.

2. The Data

The sample for the estimation includes 26 origin countries and their exports to 66 destinations over the 2007-2017 period, in the form of an unbalanced panel dataset extracted from the OECD Globalization Database (OECD, 2017). The data records two basic components of the export flows, namely (1) the number of exporting firms, referred to as extensive (firms) margin, and (2) the mean size of exports per firm, referred to as intensive margin; we multiply the two to get the aggregate export flows, as the magnitude of a country's export flows to a specific destination depends on these two components. This would help us in comparing the results between aggregate exports and the respective margins of exports as well. The limitation of the dataset is that it does not record zero export flows between country pairs. Comparisons with trade values in standard trade statistics, such as UN Comtrade by UNCTAD, may be essential to determining the representativeness of the data. Since 297 observations in the OECD data set are categorized as "non-publishable and confidential value" and 170 as "non-publishable but non-confidential value," it is very challenging for us to show the relationship between the trade values in this study's sample and the values in a different dataset. It is important to note that, as of 2006, the United Nations Statistical Department (UNSD) processed all non-OECD data, while the OECD processed all OECD data. Periodically, the data from the UNCTAD and OECD trade databases are synchronized (Egger & Wolfmayr, 2018, p. 91). As a result, we anticipate that the data published by OECD will be reliable for our research.

For information on EIAs, we use the data on integration agreements provided by the NSF-Kellogg Institute Database on Economic Integration Agreements and Regional Trade Agreements Database, The WTO (Bergstrand & Baier, 2017; WTO, 2020). The advantage of the data set is that it records the integration agreements between two pairs of countries based on the degree of integration. In the database, varying types of integration are listed as no agreement (0), non-reciprocal preferential trade agreement, sometimes referred to as one-way preferential trade agreement (1), two-way preferential trade agreement (2), free trade agreement (3), customs union (4), common market (5), and economic union (6). Since the data set did not cover all the periods in our sample, extra information was gathered from the RTA database, WTO, as per the database's format.

3. Decomposition of Export Margins

Liberalization of trade costs through the formation of EIAs reduces trade costs between members and encourages trade by increasing the number of exporting firms

(EM) and the average value of exports by each exporting firm (IM). We decompose the unilateral exports into two margins, i.e., extensive margin and intensive margin, such as Equation 1:

$$EX_{ab,t} = EM_{ab,t} \times IM_{ab,t} \quad (1)$$

Here, $EX_{ab,t}$ refers to exports from the origin country A to the destination country B at time *t*, and the extensive margin is denoted by $EM_{ab,t} = N_{ab,t}$, where *N* refers to the number of exporting firms that export from Country A to Country B.

Likewise, the intensive margin is the average value of exports by the firms that export from Country A to Country B. The computation is as follows (Equation 2):

$$IM_{ab,t} = \frac{EX_{ab,t}}{EM_{ab,t}} \quad (2)$$

where $IM_{ab,t}$ is the average value of exports per firm at time *t*. The summary statistics are presented in Table 2.

Table 2: Summary Statistics

	Variables Used in the Study		
	Aggregate Exports, in USD Millions	Extensive Margin, in Numbers	Intensive Margin, in USD Millions
Mean	3,788.71	2,755.14	0.89
Std. Dev.	13,588.29	4,905.00	1.83
10th Percentile	14.68	59	0.13
25th Percentile	85.63	248	0.24
50th Percentile	472.49	986	0.47
75th Percentile	2,186.13	3,110	39.85
90th Percentile	15,147.05	11,773	43.85
Observations	**5,798**	**5,798**	**5,798**

Source: Author's calculation

4. Empirical Strategy

4.1. The Gravity Specification for Estimating the Effect of EIAs on Exports and Export Margins

In a typical empirical setup, the structural gravity model has been extensively used to examine the impact of Economic Integration Agreements (EIAs) (Baier et al., 2014; Bensassi et al., 2012; Deardorff, 1998; Márquez-Ramos et al., 2015; Yotov et al., 2016). The reduced form of a structural panel gravity specification with EIAs being a binary variable (takes the value 1 if there is an EIA in place between the country pair and 0, otherwise) takes the form (Equation 3) (Baier & Bergstrand, 2007; Egger et al., 2011; Yotov et al., 2016, p. 21):

$$lnEX_{ab,t} = \beta_0 + \beta_1 EIA_{ab,t} + \eta_{ab} + \delta_{a,t} + \psi_{b,t} + \varepsilon_{ab,t} \quad (3)$$

where $lnEX_{ab,t}$ reflects the export flows from Country A to Country B at time *t*. Here, $\delta_{a,t}, \psi_{b,t}$ are exporter-time and importer-time fixed effects that capture the time-varying factors of respective trade partners, and they capture the export and importer-specific multilateral resistance terms as well. Furthermore, η_{ab} is a pair-specific effect that captures time-invariant factors like the economic distance between partners and other bilateral characteristics. One key prediction of the model with heterogeneous firms is that the extensive margin is affected by both fixed and variable trade costs; however, the intensive margin is affected by the variable costs only (Helpman et al., 2008; Melitz, 2003; Melitz & Ottaviano, 2008). To capture the distinct effects of trade cost changes on each margin, researchers divide the total exports into these two margins while using gravity models with heterogeneous firms. The effect of trade cost changes on the aggregate volume of exports is the sum of the effects on the intensive and extensive margins.

Our empirical specification draws from the work of Baier and Bergstrand (2007), who re-examined the econometric application of the gravity equation to estimate the impact of EIAs on trade flows between pairs of countries. As the authors outlined, various econometric problems must be addressed when estimating the gravity equation empirically. Firstly, the EIA dummy suffers from an endogeneity problem and potentially biases the gravity specification. This is because country pairs that form EIAs are not randomly selected, but some time-invariant bilateral variables like religious or historical ties or other bilateral factors simultaneously influence the presence of an EIA and the exports. The authors suggest that instead of cross-sectional data, panel data needs to be preferred for estimating gravity equations with EIAs, as unobserved time-invariant heterogeneity across country pairs that might influence the formation of the EIAs can be captured by a bilateral fixed effect (Baier & Bergstrand, 2007). Secondly, for capturing the time-varying characteristics of exporters and importers, the authors incorporated exporter-time and importer-time fixed effects, which also capture the time-varying unobservable "multilateral resistance" terms of respective trade partners.

Thirdly, economic integration agreements are usually formed to modify the terms of trade and trade agreements and have a "phased-in" period to account for the phased-in nature of free trade agreements and lagged terms-of-trade effects. Baier & Bergstrand (2007) suggested an *average treatment effects* (ATE) model and estimated the effect of FTAs on trade. In the model, apart from the current FTA, two lags of the FTA variable are introduced to the gravity specification, and the total effect is calculated by summing the significant coefficients of the three coefficients. The specification is Equation 4:

$$\begin{aligned} Trade_{ab,t} = exp\,[&\delta_{a,t} + \psi_{b,t} + \eta_{ab} + \beta_5 FTA_{ab,t} \\ &+ \beta_6 FTA_{ab,t-1} + \beta_7 FTA_{ab,t-2}] \times \varepsilon_{ab,t} \end{aligned} \quad (4)$$

where the term $Trade_{ab,t}$ represents the aggregate trade flows. Typically, ATE estimates give a more precise calculation of the effects of economic integration agreements than the earlier literature on structural gravity (Baier et al., 2014, p. 26).

In its multiplicative form, Equation (3) serves as the baseline specification for our model estimation of the effects of EIAs on exports and extensive and intensive margins. The first objective of this paper is to assess the effects of the EIAs on exports and export (firm) margins with structural gravity as the specification. We integrate two lags of the EIA variable into the econometric specification to account for "*phased-in*" characteristics

of the EIAs and the nature of EIAs in modifying the terms of trade.[2] In reality, integration agreements are rarely put into effect right away; rather, they are generally implemented over a time horizon of ten years or longer. In this paper, we use an "Average Treatment Effect (ATE) Model" to estimate the effect of EIAs with the integration effect equal to the total of the statistically significant coefficients of the variables, namely the current EIA and the two lags of the EIA variable. We would also like to mention that for capturing the regional variations, we included a dummy variable which takes the value 1 if the exports originate from a developed region and 0 otherwise. However, the variable was eliminated due to perfect collinearity during estimation.

Though our dataset does not record zero export flows between country pairs, we have a significant number of observations, especially those related to intensive margins close to zero. Hence, instead of taking the log of the dependent variables, we prefer the Poisson Pseudo Maximum Likelihood (PPML) estimator. PPML estimator is widely used by researchers as it gives better estimates with the presence of zero export flows, and it performs more efficiently to account for the heteroskedasticity in the trade data (Silva & Tenreyro, 2006). PPML specifications are usually used in the multiplicative form, and when using PPML estimators, for a better economic interpretation, the effect of EIAs (Equation 3) is usually calculated in percentage terms such as Equation 5 (Baier & Bergstrand, 2007; Yotov et al., 2016, p. 22):

$$[e^{\widehat{\beta 1_{EIA}}} - 1] \times 100 \tag{5}$$

The summary of observations is provided in the appendix section. To avoid computational difficulties in estimating such models with a large number of fixed effects using PPML,[3] we implement high dimensional fixed effects. PPML estimator developed by Correia et al. (2020) that allows for fast and efficient estimation of structural gravity parameters for evaluating the impact of trade policies (Correia et al., 2020).

The model specifications are (Eq. (6) – Eq. (8)):

$$EX_{ab,t} = exp\,[\delta_{a,t} + \psi_{b,t} + \eta_{ab} + \beta_5 EIA_{ab,t} + \beta_6 EIA_{ab,t-1} + \beta_7 EIA_{ab,t-2}] \times \varepsilon_{ab,t} \tag{6}$$

$$EM_{ab,t} = exp\,[\delta_{a,t} + \psi_{b,t} + \eta_{ab} + \theta_5 EIA_{ab,t} + \theta_6 EIA_{ab,t-1} + \theta_7 EIA_{ab,t-2}] \times \upsilon_{ab,t} \tag{7}$$

$$IM_{ab,t} = exp\,[\delta_{a,t} + \psi_{b,t} + \eta_{ab} + \gamma_5 EIA_{ab,t} + \gamma_6 EIA_{ab,t-1} + \gamma_7 EIA_{ab,t-1}] \times \xi_{ab,t} \tag{8}$$

where the terms $EX_{ab,t}$, $EM_{ab,t}$, $IM_{ab,t}$ indicate the aggregate export flows, extensive margins, and intensive margins, respectively. Here, $\delta_{a,t}$, the exporter-time fixed effects capture the time-varying characteristics of the origin country, $\psi_{b,t}$, the importer-time fixed effects capture the time-varying characteristics of the destination country, and η_{ab}, the country pair-fixed effects that capture the bilateral characteristic that exists between the origin and the destination. Importantly, in our panel specification, the importer-time fixed effects control for the fixed export costs that change over time.

[2]We only utilize two lags because half of the country pairs in our sample have data that spans less than 5 years; hence, the period is not sufficiently large to consider the 3rd lag. In the existing literature, most researchers considered one or two lags in their specification while estimating the *ex post* effects of EIAs (Baier & Bergstrand, 2007; Soete & Van Hove; 2017). We did, however, test the addition of the 3rd lag with a smaller sample of country pairs with more than 5 years of data. All additional coefficients linked to the 3rd lag of the EIAs are insignificant.

[3]Such models with many fixed effects using PPML are plagued with convergence issues.

In the specifications, $EIA_{ab,t}$ refers to the variable that captures the economic integration agreement that takes the value 1 if there is an integration agreement in place between the country pair at time *t* and 0; otherwise. $EIA_{ab,t-1}$ and $EIA_{ab,t-2}$ represent the 1st and 2nd lags of the $EIA_{ab,t}$ variable.

4.2. Testing for Potential "Reverse Causality" between Exports and EIAs

We investigate the potential reverse causality by incorporating a new variable. $EIA_{ab,t+1}$ to our specification that captures the future EIAs and confirm that there are no feedback effects from aggregate export changes to EIA changes and that there is no "reverse causality" between exports and EIAs via country pairs. If EIAs are exogenous to the current export flows, the coefficient associated with this new variable $EIA_{ab,t+1}$ should be uncorrelated to the exports. The specification is Equation 9 (Baier & Bergstrand, 2007; Wooldridge, 2010, p. 325; Yotov et al., 2016, p. 52):

$$EX_{ab,t} = exp\,[\delta_{a,t} + \psi_{b,t} + \eta_{ab} + \beta_5 EIA_{ab,t} + \beta_6 EIA_{ab,t-1} + \beta_7 EIA_{ab,t-2} + \beta_8 EIA_{ab,t+1}\,] \times \varepsilon_{ab,t} \tag{9}$$

where the term $EX_{ab,t}$ refers to the aggregate export flows from Country A to Country B at time *t*.

4.3. Specifications for Estimating the Effect of Different Types of EIAs

The second objective of this paper is to examine the impact of different types of EIAs. Following Baier et al. (2014) and Soete and Van Hove (2017), we employ three sets of dummy variables in our specification. The first variable, CUCMEU, is created by combining economic union, common market, and customs union into one variable, and the second variable, FTA, captures if any free trade agreements between country pairs are in place. The third variable, PTA, captures if there are any preferential agreements in place between country pairs. Two lags of the CUCMEU, FTA, and PTA variables are added to the equation for capturing the lagged effect of different types of EIAs, and we estimate the distinct effects of these on the aggregate exports and export margins by calculating the total average treatment effect. $CUCMEU_{ab,t-1}$ and $CUCMEU_{ab,t-2}$ represent the 1st and 2nd lags of the $CUCMEU_{ab,t}$ variable, $FTA_{ab,t-1}$ and $FTA_{ab,t-2}$ represent the 1st and 2nd lags of the $FTA_{ab,t}$ variable, $PTA_{ab,t-1}$ and $PTA_{ab,t-2}$ represent the 1st and 2nd lags of the $PTA_{ab,t}$ variable.

The empirical specifications with different types of EIAs are Equations 10- 12:

$$\begin{aligned} EX_{ab,t} = exp\,[&\delta_{a,t} + \psi_{b,t} + \eta_{ab} \\ &+ \beta_5\, CUCMEU_{ab,t} \\ &+ \beta_6 CUCMEU_{ab,t-1} \\ &+ \beta_7 CUCMEU_{ab,t-2} \\ &+ \beta_8 FTA_{ab,t} + \beta_9 FTA_{ab,t-1} \\ &+ \beta_{10} FTA_{ab,t-2} + \beta_{11} PTA_{ab,t} \\ &+ \beta_{12} PTA_{ab,t-1} \\ &+ \beta_{13} PTA_{ab,t-2}] \times \varepsilon_{ab,t} \end{aligned} \tag{10}$$

$$
\begin{aligned}
EM_{ab,t} = exp\,[&\delta_{a,t} + \psi_{b,t} + \eta_{ab} \\
&+ \theta_5\, CUCMEU_{ab,t} \\
&+ \theta_6 CUCMEU_{ab,t-1} \\
&+ \theta_7 CUCMEU_{ab,t-2} \\
&+ \theta_8 FTA_{ab,t} + \theta_9 FTA_{ab,t-1} \\
&+ \theta_{10} FTA_{ab,t-2} + \theta_{11} PTA_{ab,t} \\
&+ \theta_{12} PTA_{ab,t-1} \\
&+ \theta_{13} PTA_{ab,t-2}] \times \upsilon_{ab,t}
\end{aligned} \tag{11}
$$

$$
\begin{aligned}
IM_{ab,t} = exp\,[&\delta_{a,t} + \psi_{b,t} + \eta_{ab} \\
&+ \gamma_5\, CUCMEU_{ab,t} \\
&+ \gamma_6 CUCMEU_{ab,t-1} \\
&+ \gamma_7 CUCMEU_{ab,t-2} \\
&+ \gamma_8 FTA_{ab,t} + \gamma_9 FTA_{ab,t-1} \\
&+ \gamma_{10} FTA_{ab,t-2} + \gamma_{11} PTA_{ab,t} \\
&+ \gamma_{12} PTA_{ab,t-1} \\
&+ \gamma_{13} PTA_{ab,t-2}] \times \xi_{ab,t}
\end{aligned} \tag{12}
$$

where the terms $EX_{ab,t}$, $EM_{ab,t}$, $IM_{ab,t}$ represents the aggregate export flows, extensive margins, and intensive margins, respectively. Here, $CUCMEU_{ab,t}$ refers to the variable that takes the value 1 if the country pair is part of either an EU or a CM or a CU at time *t* and 0, otherwise; $FTA_{ab,t}$ refers to the variable taking the value 1 if there is a free trade agreement in place between the country pair at time *t* and 0, otherwise; $PTA_{ab,t}$ refers to the variable taking the value 1 if there is a preferential trade agreement in place between the country pair at time *t* and 0, otherwise.

5. Empirical Findings

The estimation results for Equations 6 to 8 are presented in Table 1. Column (1), Column (2), and Column (3) present the coefficient estimates for aggregate exports, extensive margin, and intensive margin, respectively. Column (4) reports the results of the strict exogeneity test of EIA changes to the export flow changes. When we look at the effects of EIAs on aggregate exports, we see that there is conclusive evidence that having EIA between country pairs raises aggregate exports by an average of 35 percent $[(e^{0.30} - 1) \times 100]$. EIAs also have a positive impact on export margins as well; however, the effect on the intensive margin is greater than the effect on the extensive margin, which is in line with the existing findings on (goods) export margins (Baier et al., 2014; Bensassi et al., 2012; Berthou & Fontagné, 2008; Márquez-Ramos et al., 2015).

Our estimates suggest that EIAs increase extensive margins and intensive margins by an average of 12 percent $[(e^{0.12} - 1) \times 100]$ and 22 percent $[(e^{0.20} - 1) \times 100]$, respectively. As there is a fixed cost for export, a reduction in trade costs would affect the intensive margin sooner than the extensive margin because changes in the intensive margin do not require any entry costs. Such costs determine the extensive margin and delay the entry of new firms into the export market; hence, our findings are consistent with theoretical expectations as we have a smaller effect on extensive margins. Column (4) confirms that there is no reverse causality as the coefficient associated with the variable $EIA_{ab,t+1}$ is statistically not significant.

Table 1: Panel Gravity Estimations with Three-way Fixed Effects

Variables	(1) EX	(2) EM	(3) IM	(4) Reverse Causality
$EIA_{ab,t}$	0.297***	0.092**	0.286**	0.283***
	(0.081)	(0.034)	(0.126)	(0.081)
$EIA_{ab,t-1}$	-0.020	0.033**	0.016	-0.032
	(0.026)	(0.011)	(0.038)	(0.025)
$EIA_{ab,t-2}$	-0.056	-0.032	-0.082*	-0.067*
	(0.037)	(0.020)	(0.048)	(0.039)
$EIA_{ab,t+1}$				-0.056
				(0.037)
Total ATE	**0.30**	**0.12**	**0.20**	-
Fixed Effects:				
Exporter-Year	Yes	Yes	Yes	Yes
Importer-Year	Yes	Yes	Yes	Yes
Country-Pair	Yes	Yes	Yes	Yes
R Squared	0.98	0.99	0.98	0.98
Observations	5,798	5,798	5,798	5,798

*Notes: The aggregate export flows, the extensive margin, and the intensive margin are the dependent variables for Columns (1), (2), and (3), respectively, and are at level. The dependent variable for Column (4) is the aggregate export flows at levels where the results of the strict exogeneity test of the EIA changes to the export flow changes are reported. The average treatment effect is the total of significant coefficients, significance levels: *** p<.01, ** p<.05, * p<.10, and robust standard errors are reported in parentheses.*

Source: Author's calculation

It's important to note that north-north economic agreements are more likely to be of higher degrees that allow greater integration compared to a north-south country participant in such economic agreements. Is this the key reason why intensive margins are found to have a greater effect due to EIAs? We investigate this issue by estimating the effect of the EIAs by restricting the sample to only non-Intra-EU country pairs. The results as outlined in

Table 2 suggest that having EIA between non-Intra-EU country pairs increases the intensive margin by 42 percent $\left[(e^{0.36} - 1) \times 100\right]$, on average. This means that existing exporters are indeed able to increase the scale of their exports under these economic agreements. The effect on extensive margins is inconclusive. Because changes in extensive margin require a fixed cost of exporting, the changes to extensive margin will likely take place over a longer period of time.

Table 2: Estimation Results with Non-Intra-EU Country Pairs

Variables	Estimation Results of Reduced Sample		
	(1) EX	(2) EM	(3) IM
$EIA_{ab,t}$	0.110	-0.024	0.362**
	(0.081)	(0.022)	(0.139)
$EIA_{ab,t-1}$	0.041	-0.018	0.055
	(0.051)	(0.011)	(0.035)
$EIA_{ab,t-2}$	-0.060	0.006	-0.066
	(0.058)	(0.010)	(0.042)
Total ATE	**-**	**-**	**0.36**
Fixed Effects:			
Exporter-Year	Yes	Yes	Yes
Importer-Year	Yes	Yes	Yes
Country Pair	Yes	Yes	Yes
R Squared	0.99	0.99	0.98
Observations	3,170	3,170	3,170

*Notes: The aggregate export flows, the extensive margin, and the intensive margin are the dependent variables for Columns (1), (2), and (3), respectively, and are at level. The average treatment effect is the total of significant coefficients, significance levels: *** p<.01, ** p<.05, * p<.10, and robust standard errors are reported in parentheses.*

Source: Author's calculation

Table 3 reports the results using PPML Equations 10 - 12 with the same specification for three alternative dependent variables. EX refers to the aggregate export flows from Country A to Country B at time *t* (or $EX_{ab,t}$ in Equations10). EM refers to the extensive margin (or $EM_{ab,t}$ in Equation11). IM refers to the intensive margin (or $IM_{ab,t}$ in Equation12). In contrast to Baier et al. (2014), we do not find a conclusive effect of CUCMEU, FTAs, and PTAs on aggregate exports. However, our findings are consistent with Soete & Van Hove (2017), as the authors find the effect of CU on aggregate exports is statistically insignificant (Baier et al., 2014; Soete & Van Hove, 2017). The effect of aggregate exports is the sum of the effects of both extensive and intensive margins. As we notice that the effect of CUCMEU on extensive margins is not significant, the total effect fails to provide a piece of conclusive evidence.

We discover that the intensive margin is primarily responsible for the impacts of CUCMEU, as the intensive margin effect dominates that of the extensive margin. This is consistent with the recent theoretical predictions that claim that impacts on the extensive margin will be less than those on the intensive margin because entering a foreign market requires fixed export (entry) costs. Changes in the size of exports, however, do not require any entry costs. The empirical findings of Baier et al. (2014) and Soete & Van Hove (2017) indicate the effects of EIAs on intensive margins are larger than the extensive margin effects that support this assertion (Baier et al., 2014; Soete & Van Hove, 2017). Comparing the findings of the different types of EIAs, we can observe that CUCMEU increases the intensive margin by an average of 35 percent $[(e^{0.30} - 1) \times 100]$ whereas in the case of FTAs and PTAs, the effects are negative. Country pairs having FTAs have intensive margins falling by 13 percent $[(e^{-0.13} - 1) \times 100]$ and 18 percent $[(e^{-0.18} - 1) \times 100]$, respectively, on average.

One of the key reasons why intensive margins might not be impacted by EIAs, particularly in FTAs or PTAs, could be due to restrictive Rules of Origin (ROO) (Krueger, 1997, pp. 177-178). The ROO establishes a standard under which products

imported by a member state will be deemed to have originated within the framework of integration agreements and hence qualify for preferential treatment in the case of PTAs or duty-free treatment in the case of FTAs (Brenton & Manchin, 2003; Krueger, 2012). Before claiming favors under the terms of an EIA, firms typically face administrative or documentation costs to ensure that their products meet the appropriate ROO (Augier et al., 2005; Brenton & Manchin, 2003; Manchin & Pelkmans-Balaoing, 2007). Such costs result in the underutilization of FTAs or PTAs. The second important determinant of the utilization of FTAs or PTAs is "tariff margins," i.e., the difference between MFN tariffs and preferential tariffs. The greater the tariff margins, the greater the advantage that exporting firms have over overseas competitors. The negative effects of FTAs and PTAs may be because of lower tariff margins.

Unlike intensive margins, there is no conclusive evidence of the greater effect of CUCMEU on extensive margins. FTAs and PTAs have a significant effect on extensive margins, where having an FTA increases the number of firms between country pairs by an average of 9 percent $[(e^{0.09} - 1) \times 100]$. Likewise, having a PTA increases the number of firms between country pairs by an average of 2 percent $[(e^{0.02} - 1) \times 100]$. Thus, it appears that FTAs have a greater effect on extensive margins than PTAs. These empirical findings are consistent with the theoretical models with heterogeneous firms, which suggest that trade policy instruments like EIAs reduce the cost threshold and, hence, allow some new firms to enter the export market that have not exported before (Melitz & Ottaviano, 2008).

Table 3: Effect of Various Types of EIAs

Variables	**Estimation Results**		
	(1)	**(2)**	**(3)**
	EX	**EM**	**IM**
$\boldsymbol{CUCMEU_{ab,t}}$	0.185 (0.208)	0.035 (0.045)	0.309** (0.144)
$\boldsymbol{CUCMEU_{ab,t-1}}$	-0.172 (0.118)	0.013 (0.026)	0.022 (0.058)
$\boldsymbol{CUCMEU_{ab,t-2}}$	0.045 (0.082)	-0.033 (0.030)	-0.070 (0.074)
Total ATE	-	-	**0.30**
$\boldsymbol{FTA_{ab,t}}$	0.058 (0.165)	0.074* (0.042)	0.121 (0.146)
$\boldsymbol{FTA_{ab,t-1}}$	-0.046 (0.052)	0.022* (0.011)	-0.011 (0.048)
$\boldsymbol{FTA_{ab,t-2}}$	0.007 (0.069)	-0.020 (0.020)	-0.135* (0.079)
Total ATE	-	**0.09**	**-0.13**
$\boldsymbol{PTA_{ab,t}}$	0.213 (0.147)	-0.003 (0.034)	-0.186* (0.112)
$\boldsymbol{PTA_{ab,t-1}}$	0.033 (0.048)	0.029** (0.014)	0.036 (0.051)
$\boldsymbol{PTA_{ab,t-2}}$	-0.047 (0.050)	-0.016 (0.017)	-0.023 (0.071)
Total ATE	-	**0.02**	**-0.18**
Fixed Effects:			
Exporter-Year	Yes	Yes	Yes
Importer-Year	Yes	Yes	Yes
Country Pair	Yes	Yes	Yes
R Squared	0.98	0.99	0.98
Observations	5,798	5,798	5,798

*Notes: The aggregate export flows, the extensive margin, and the intensive margin are the dependent variables for Columns (1), (2), and (3), respectively, and are at level. The average treatment effect is the total of significant coefficients, significance levels: *** p<.01, ** p<.05, * p<.10, and robust standard errors are reported in parentheses.*

Source: Author's calculation

In summary, we find that CUCMEU has larger effects on intensive margins than FTAs or PTAs. However, we could not find any conclusive evidence of a distinct effect

of CUCMEU and these two types of integration agreements in terms of aggregate exports and extensive margins. This is plausible as our sample's time is not sufficiently large enough to capture the entire effect of the EIAs. Baier & Bergstrand (2007) and Baier et al. (2014) suggest that the full effect of EIAs on trade flows can be realized in 10 to 15 years. Thus, from a longer-term perspective, this can be further analyzed if large time-series data on export (firm) margins are available.

We would also like to highlight that several countries might be signatories to more than one EIA between members, such as bilateral or plurilateral agreements, each having different levels of commitment. One of the major limitations of this paper is that the analyses here do not capture the distinct effect of such multiple EIAs on extensive/intensive margins. Due to the limited number of countries included in the sample, the number of EIAs is not large. To be more precise, the majority of the agreements in the sample, like the EU, have been in place since the start of the sample period. So, the empirical results should be interpreted cautiously, though the effects of these agreements are absorbed in the country-pair fixed effects. The coefficients on the EIA dummy show the effects of EIAs that enter into force during the sample period; hence, we are listing a total of 25 EIAs that enter into force during the sample period in the appendix section.

6. Conclusions

Recent advancements in trade theory emphasize firm heterogeneity (where firms differ in terms of productivity or costs) and entry (sunk) costs of exporting, hence allowing researchers to estimate the impact of EIAs on extensive and intensive margins of trade. These margins can be classified into three categories: country, firm, and goods. Several studies have investigated and estimated the impact of EIAs on the trade margins of goods using econometric models; however, less attention has been given to the effects of EIAs on firms' margins. By using panel data from 2007 to 2017 that includes exports from 26 countries to 66 destinations and employing a methodology that is consistent with structural gravity specifications, we provide evidence of the effect of EIAs on export margins, i.e., both intensive and extensive (firm) margins.

We incorporate importer-time and exporter-time fixed effects, as is standard in the recent trade literature, to account for multilateral resistance terms and country-time-specific shocks. Furthermore, to capture time-invariant determinants of bilateral trade costs and unobservable country-pair features that may influence trade intensity and the likelihood of two countries signing a trade agreement, we incorporate country-pair fixed effects in our empirical specifications. Our findings imply that EIAs have a differential influence on export margins, where the effect is greater on intensive margins than on extensive margins. We also uncover evidence of different types of EIAs having varied effects on these intensive and extensive margins of trade; higher the degrees of economic agreements, the stronger the impact on the intensive margin. Upgrading lower degrees of economic agreements to higher degrees would be a piece of policy advice, given the conclusive evidence that higher degrees of agreements have a stronger effect on intensive margins than lower degrees.

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Appendices

Appendix 1: Summary of the Dataset

EIA Ranking	Type of EIA	Freq.	Percent	Cum.
0	No Integration	1,655	28.54	28.54
1	OWPTA	257	4.43	32.98
2	TWPTA	97	1.69	34.67
3	FTA	1,162	20.02	54.69
4	CU	147	2.54	57.23
5	CM	1,472	25.39	82.61
6	EU	1,008	17.39	**100**
Total		**5,798**	**100**	

Source: Author's calculation

Appendix 2: Summary of Observations

Exports, In USD Millions	Observations
Less than 1	120
1 to 5	306
>5 and <=10	389
>10	4,983
Total Obs.	**5,798**
Extensive Margin, In Numbers	**Observations**
Less than 10	90
10 to 20	128
>20 and <=30	123
>30	5,457
Total Obs.	**5,798**
Intensive Margin, In USD Millions	**Observations**
Less than 0.2	1,160
0.2 to 0.5	1,847
0.51 to 0.99	1,325
>1	1,466
Total Obs.	**5,798**

Source: Author's calculation

Appendix 3: Exporter Countries

List of Origin Countries
Austria, Belgium, Switzerland, Cyprus, Czechia, Germany, Denmark, Spain, France, United Kingdom, Hungary, Israel, Korea, Lithuania, Luxembourg, Latvia, Mexico, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, and Türkiye

Source: Author's compilation

Appendix 4: Importer Countries

List of Destination Countries
Algeria, Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czechia, Chile, China, Croatia, Cyprus, Denmark, Egypt, Estonia, Finland, France, Germany, Great Britain, Greece, Hongkong (China), Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kazakhstan, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mauritania, Mexico, Netherlands, New Zealand, Nigeria, Norway, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Korea, Spain, Sweden, Switzerland, Taiwan (China), Thailand, Tunisia, Türkiye, Ukraine, United Arab Emirates, United States, Venezuela, and Vietnam

Source: Author's compilation

Appendix 5: List of Agreements That Enter into Force

Sl.	Agreement Name	Coverage	Type	Date of notification	Date of entry into force	Signatories
1	Türkiye - Singapore	Goods & Services	FTA	14-Sep-18	01-Oct-17	Singapore; Türkiye
2	EU - Canada	Goods & Services	FTA	19-Sep-17	21-Sep-17	Canada; All EU Countries
3	EU - SADC	Goods	FTA	03-Apr-17	10-Oct-16	Botswana; Lesotho; Mozambique; Namibia; South Africa; Eswatini; All EU Countries
4	Pacific Alliance	Goods & Services	FTA	03-Nov-16	01-May-16	Chile; Colombia; Mexico; Peru
5	Korea, Republic of - Viet Nam	Goods & Services	FTA	02-Mar-16	20-Dec-15	Korea, Republic of; Vietnam
6	China - Korea, Republic of	Goods & Services	FTA	01-Mar-16	20-Dec-15	China; Korea, Republic of
7	Korea, Republic of - New Zealand	Goods & Services	FTA	21-Dec-15	20-Dec-15	Korea, Republic of; New Zealand
8	Türkiye - Malaysia	Goods	FTA	20-Feb-17	01-Aug-15	Malaysia; Türkiye
9	Korea, Republic of - Australia	Goods & Services	FTA	22-Dec-14	12-Dec-14	Australia; Korea, Republic of
10	EFTA - Gulf Cooperation Council (GCC)	Goods & Services	FTA	06-Oct-22	01-Jul-14	Iceland; Liechtenstein; Norway; Switzerland; Bahrain, Kingdom of Kuwait; the State of Oman; Qatar; Saudi Arabia, Kingdom of United Arab Emirates
11	Switzerland - China	Goods & Services	FTA	30-Jun-14	01-Jul-14	China; Switzerland
12	EU - Ukraine	Goods & Services	FTA	01-Jul-14	23-Apr-14	Ukraine; All EU Countries
13	EU (28) Enlargement	Goods & Services	CU	25-Apr-13	01-Jul-13	All EU Countries
14	EFTA - Hong Kong, China	Goods & Services	FTA	27-Sep-12	01-Oct-12	Hong Kong, China; Iceland; Liechtenstein; Norway; Switzerland

Sl.	Agreement Name	Coverage	Type	Date of notification	Date of entry into force	Signatories
15	EFTA - Ukraine	Goods & Services	FTA	18-Jun-12	01-Jun-12	Ukraine; Iceland; Liechtenstein; Norway; Switzerland
16	Korea, Republic of - United States	Goods & Services	FTA	15-Mar-12	15-Mar-12	Korea, Republic of; United States of America
17	EU - Korea, Republic of	Goods & Services	FTA	07-Jul-11	01-Jul-11	Korea, Republic of; All EU Countries
18	Türkiye - Chile	Goods	FTA	25-Feb-11	01-Mar-11	Chile; Türkiye
19	Korea, Republic of - India	Goods & Services	FTA	01-Jul-10	01-Jan-10	India; Korea, Republic of
20	Japan - Switzerland	Goods & Services	FTA	01-Sep-09	01-Sep-09	Japan; Switzerland
21	EFTA - Canada	Goods	FTA	04-Aug-09	01-Jul-09	Canada; Iceland; Liechtenstein; Norway; Switzerland
22	EFTA - SACU	Goods	FTA	29-Oct-08	01-May-08	Iceland; Liechtenstein; Norway; Switzerland; Botswana; Lesotho; Namibia; South Africa; Eswatini
23	EFTA - Egypt	Goods	FTA	17-Jul-07	01-Aug-07	Egypt; Iceland; Liechtenstein; Norway; Switzerland
24	Egypt - Türkiye	Goods	FTA	05-Oct-07	01-Mar-07	Türkiye; Egypt
25	EC (27) Enlargement	Goods & Services	CU	27-Sep-2006(G) / 26-Jun-2007(S)	01-Jan-07	All EU Countries

Notes:

1. A total of 25 EIAs enter into force during our study period involving the sampled country pairs.
2. Agreements are ordered from the newest to the oldest period.
3. All EU Countries: Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovak Republic; Slovenia; Spain; Sweden
4. EC (27) enlargement refers to when Bulgaria and Romania, join the EU, bringing the number of member states to 27 countries. Bulgaria and Romania joined the EU on January 1, 2007.
5. EC (28) enlargement refers to when Croatia joined the EU, bringing the number of member states to 28 countries. Croatia becomes the European Union's 28th member state on 1 July 2013.

Source: (Bergstrand & Baier, 2017; WTO, 2020)