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The EU–South Korea FTA: Which Sector Benefits the Most?

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Abstract

Purpose – This study empirically analyzes the effects of the European Union-South Korea Free Trade Agreement on Korean exports in major sectors.
Design/Methodology - This study is based on the augmented gravity model with a panel data set covering 51 countries between the years 2000 and 2015.
Findings - Main findings of the present study is that the agreement has affected the chemical sector the most. Fixed effects estimation predicted a positive trade effect of 38.3%, while Poisson maximum likelihood estimation predicted an impact of 4.75% in the chemical export sector. Regression results for the other sectors only show insignificant effects.
Originality/value - The findings imply that the effects of the EU-South Korea free trade agreement on the Korean exports are quite specific compared to the European ones, meaning that the Korean government should focus on sector-specific programs to maximize the welfare benefits of the free trade agreement.

Keywords: EU-South Korea FTA, Fixed Effect, Panel Data, Poisson, Sectoral Analyses
JEL Classifications: F14, F15, R10

1. Introduction

The end of the 20th century was characterized by increasingly regionalized international trade. Some good known examples of the trade integration between geographically proximate groups of countries are the Southern Common Market in Latin America and the European Union (EU) (Juust et al., 2017). In the 2000s, this trend of regionalization developed further into so-called mega-regional trade agreements such as the Trans-Pacific Partnership and the proposed Trans-Atlantic Partnership, which are signed between geographically distant major industrial countries (Baldwin, 2014). Another example of such a mega-regional trade agreement is the European Union-South Korea Free Trade Agreement which has been provisionally applied since 2011 and was formally ratified in 2015 (FTA; Juust et al., 2017).

The FTA between the EU and South Korea is the result of major economic and political developments in the last decades. From an economic point of view, trade between Europe and Asia has greatly increased since the turn of the millennium. An outstanding example is the relation between the EU and South Korea, where the 27 member states of the EU collectively passed the United States in economic importance to South Korea in 2005. Even if this changed again with the Euro Crisis in 2010, Fig. 1 highlights the new, strong economic ties between Europe and South Korea.

Besides the economic reasoning, the EU-South Korea FTA is the result of new strategies in the trade policy of both countries. In the first half of the last decade, the EU has shifted to a

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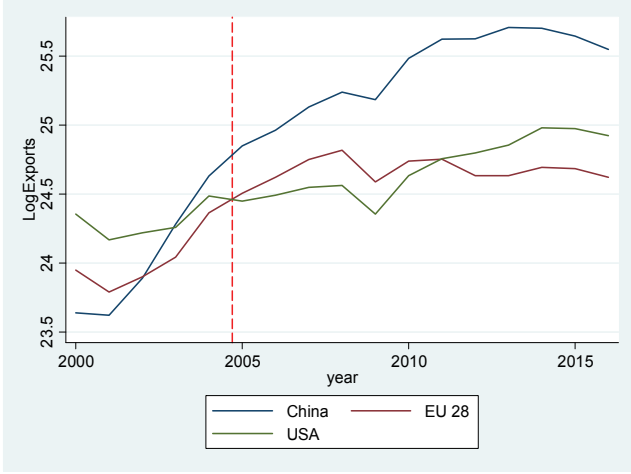
trade policy that envisages a greater use of Free Trade Agreements, mainly driven by political and commercial reason. In 2006, the EU identified South Korea as one of its FTA priorities in Asia to ensure the competitiveness of European manufacturers against the background of current and future FTAs between Japan, China and ASEAN countries (Gavin and Sindzingre, 2009). Around the same time, Korea, which emphasized the multilateral trading system for many years also changed its trade strategy towards bilateral trade agreements. Especially the increasing competition from Chinese and Japanese companies and the demographic change have heightened the sense of urgency about boosting competitiveness (Cooper, 2011). In 2009, the Korean government stated that it wants to build a free trade network till 2014, such that 70% of South Korean exports enjoy duty free access (Ministry of Foreign Affairs and Trade (MOFAT), 2009). Therefore the EU-South Korea Free Trade Agreement reflects the new trade strategies of the two sides to strengthen economic ties outside their home regions.

Fig. 1. South Korea's Main Export Flows



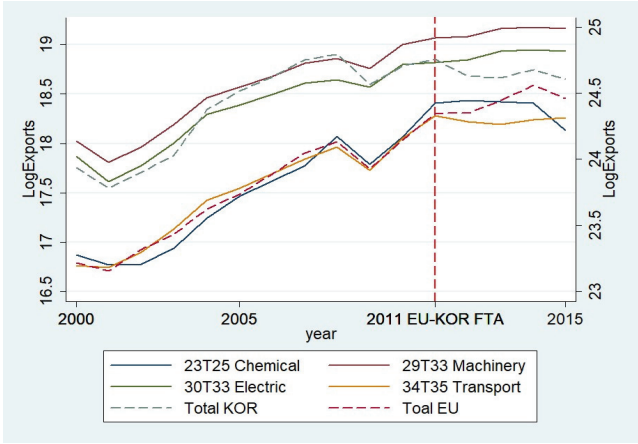
Source: OECD CRS (2017).

With the provisional enforcement of the FTA in July 2011, Korea entered its largest agreement in terms of market size. Most studies done on the potential impact of the FTA estimate that the relatively larger impact would be on the South Korean economy. In terms of trade, those studies predict that especially South Korean manufacturers of cars and chemical products would increase their exports to the EU market (Cooper, 2011).

While the European Commission closely monitors imports and exports between the EU and South Korea, the literature lacks an empirical analysis of the effects of the FTA from a South Korean perspective. Forizs and Nilsson (2017) conducted a descriptive analysis of the South Korean exports to the EU between 2011 and 2015 showing that the machinery, chemical, and transport equipment sectors were the most promising exports sectors from a Korean perspective. Machinery was by far the largest export market in 2011, the chemical and transport industries showed the largest growth rates. Fig. 2 below, however, shows that the trade effects for South Korea seem to be significantly different from the effects for the EU; the two dashed lines represent Korea's total exports to Europe and vice versa, and the solid lines represent Korea's exports to the EU in the main export sectors. The total exports, which are plotted on the second axes, show the reverse following the enforcement of the FTA in 2011: Whereas EU exports to Korea increased, the Korean exports to the EU decreases. At the sector

level the picture is less pessimistic, but the increase in European exports still appears to be much larger.

Fig. 2. South Korean Sectoral Export Flows



Source: OECD CRS (2017).

The trade effect of the EU-Korea FTA is from special interest because a deeper engagement between the EU and South Korea is unlikely. For example, neither side is relevant to the basic security and political issues of the other (Kelly, 2011). Therefore the shown imbalance in export flows in Fig. 2 after the provisional enforcement of the FTA is the underlying motivation of this paper, which aims to answer the question whether the Korean export industries can benefit or not.

To state the conclusion up front, the FTA affects the chemical sector the most. Fixed effects (FE) estimation predicted a positive trade effect of 38.3%, and Poisson maximum likelihood (PPML) estimation predicted an impact of 4.75% in the chemical export sector. Regression result for the other sectors showed only insignificant effects, which occurs most likely because of the Euro Crises which coincides with the implementation of the Agreement in 2011. However, the findings imply that the effects of the EU-South Korea free trade agreement on the Korean exports are much more specific compared to the European ones. In conclusion, the Korean Government should focus on sector-specific programs to maximize the welfare benefits of the free trade agreement.

This study is organized as follows. This chapter provides an introduction, and the next section presents the literature review on the topic. The third chapter focuses on underlying econometric problems and the methodologies that have been applied to overcome them. Chapter 4 gives an overview of the estimation results and the interpretation, and the last chapter summarizes the results and stresses some critical points of the paper that could be used for future research.

2. Previous Studies

Even since Isard's (1971) pioneering works, the gravity model has improved both theoretically and empirically. The first theoretical foundation of these findings was applied by Anderson (1979), who used a model in which each country produces one single unique good where consumers have preferences for all goods on the world market. Bergstrand

(1985) strengthened the theoretical justification by giving a micro-foundation of the modeling approach based on the assumption of monopolistic competition between countries. Anderson and van Wincoop (2003) provided one important augmentation of the model. They showed that the classical gravity approach is potentially biased because international trade between countries is determined not only by the distance between and the economic sizes of the trading partners but also by the relative trade costs between countries, often referred to as multilateral trade resistance (MTR)[1].

Researchers have examined benefits from FTAs and have commonly used trade creation and trade diversion by implementing at least two dummy variables for the agreement of interest: One variable controls for the case that both trading partners are part of the trade agreement, and the other controls for the case that only one country is part of the agreement (Endoh, 1999, 207). Based on this approach, Rose (2004) was one of the first to study the effects of postwar multilateral trade agreements. Using the data of 175 countries for a period of 50 years, the author found that the WTO did not have any substantial effect on trade but the GSP (the Generalized System of Preferences) had a positive effect. Jayasinghe and Sarker (2008) extended this approach and analyzed trade creation and diversion effects of the North American Free Trade Agreement for six selected agrifood products using a pooled cross-sectional approach and found that the effect differed strongly by commodity. In general trade theorist predict that the reduction trade costs lead to an increase in the degree of specialization (Amiti, 1999). Therefore it is important to focus on disaggregated export flows to consider those specialization effects if one is interested in the effect of FTAs.

A more advanced and less intuitive question regarding the right specification of the gravity equation is how to address the issue of zero trade. This topic is especially interesting for disaggregated data, when it is more often the case that some trade flows are not reported. The problem stems from the common approach of using a log-linearized version of the gravity model where the zero trade flows will be dropped because the log of zero is not defined. Research results show that all standard approaches to addressing this problem, such as adding small values to each trade flow before taking the log or truncating the data by dropping zero observations, have significant drawbacks on the estimation results if certain assumptions are not fulfilled.

In this regard, Bacchetta (2012) highlighted that truncating the data for randomly distributed zeros led to unbiased results, and Silva and Tenreyro (2006) showed that in the presence of heteroscedasticity, a *Pseudo Poisson maximum likelihood* estimation (PPML) is a robust approach. Further they showed, that this approach can be applied to levels of trade data and therefore avoids dropping zero trade observations. Yang and Martinez-Zarzoso (2014) examined the impact of the ASEAN-China Free Trade Agreement on exports using such a PPML estimation. Additionally they included country-pair fixed effects, time effects, and importer and exporter dummies to control for unobserved MTR.

Endogeneity is also an important factor to consider given that policy variables potentially suffer from it. Baier and Bergstrand (2007) stressed that there are two variables in the classical gravity approach, GDP and FTA dummies, which could be handled with lagged variables or instrumental variables (Adams et al., 2009; Baier and Bergstrand, 2007; Frankel et al., 1997; Magee, 2003). However, Angrist and Krueger (2001) showed that the use of a probit model in the first stage regression, which would be required in the case of endogenous policy dummies, leads to inconsistent estimates in the second stage gravity equation.

[1] For example, two small economies such as those of Belgium and the Netherlands are surrounded by larger economies such as those of France and Germany, which tend to trade less between themselves than they would if they were surrounded by oceans, deserts, or mountains, for instance Australia and New Zealand or South Korea and Japan (Bacchetta, 2012).

3. Concept, Methods, and Data

This paper aims to answer the question of whether South Korea is benefiting from the EU-South Korea FTA. With the provisional enforcement in 2011, 94 per cent of the EU's tariffs were immediately eliminated (European Commission, 2018). Therefore, it is possible to apply simple econometric estimation methods to determine the causal effect of the FTA. To evaluate whether South Korea benefits from the agreement, this paper analyzes the flow of South Korean exports to the European Union as well as to its main trading partners based on a log-linearized version of an augmented gravity model following McCallum (1995):

$$\ln(EX_{ijt}) = \alpha_0 + \beta_1 * \ln(GDP_{it}) + \beta_2 * \ln(GDP_{jt}) + \beta_3 * \ln(DIST_{ij}) + \beta_4 * Dummy + \beta_5 * ReEx + \beta_6 * ReIm + u_{ijt} \quad (1)$$

where EX_{ijt} is export flows from country *(i)* to its trading partners *(j)* in a certain year *(t)* and GDP_{it} and GDP_{jt} refer to the GDP of country *(i)* and that of its trading partners; these were added as proxies for the sizes of the two countries' economies. $Dist_{ij}$ is the distance between the two trading partners that proxies the trading costs. Further, the model includes some control variables: First, dummy variables for the case that a country-pair has ever been in a colonial relationship (Japan and Korea in this study) and a common language that is spoken in both countries by at least 9% of the population. The variable of interest is the European Union-South Korea Free Trade Agreement dummy. A certain design feature of the FTA makes it particularly interesting from an Econometricians perspective. With the provisional enforcement in 2011, 94 % of the EU's tariffs were immediately eliminated (Stangarone, 2009). This clear cutoff allows the application of a dummy variable to estimate the causal effect of the trade agreement.

It should be noted that, due to the structure of the data with only one exporting country, it is impracticable to use the common three dummy variable approach. Further it is impossible to estimate import and export dummies (Gashi et al., 2017). This drawback of the data set implies that it is impossible to use the standard approach to control for MTR by including importer and exporter dummies in the estimation (Baldwin and Taglioni, 2007). As a number of researchers have highlighted, it is necessary to control for unobserved MTR to avoid biased estimators (Anderson and van Wincoop, 2003; Baier and Bergstrand, 2007). Most of the researchers who have analyzed the export flows of a single country neglected this potential source of heterogeneity and chose to apply simple fixed effects estimations, controlling only for unobserved country-pair fixed effects. Gashi et al. (2017) did mention that one should control for other MTR sources and add year dummies to the estimation equation to control for unobserved time effects that are similar between all countries, such as an oil price shock or economic recessions. Still, this approach does not control for individual time-varying MTR terms for each importer, such as natural disasters or other events that affect the trade costs of only a single country for only a certain period of time (Baier and Bergstrand, 2007). In this paper, two remoteness proxies, ReEx and ReIm, which are calculated by the following formula, are included in the estimation equation to control for country-individual MTR terms (Bacchetta, 2012):

$$Remoteness_i = \sum_j \frac{distance_{ij}}{GDP_i / GDP_{World}} \quad (2)$$

Even this approach has been criticized because it only captures MTR terms that are connected to the distance (Anderson and van Wincoop, 2003) it could minimize the potential bias, especially when it is applied in combination with country-pair fixed effects and year dummies.

In addition to the fixed-effects approach, which is widespread in the literature (Kepaptsoglou et al., 2010), a PPML estimation is applied to appropriately address the likely presence of heteroscedasticity (Silva and Tenreyro, 2006). The second advantage of PPML estimation, that it can be applied to levels of trade data and therefore avoids dropping zero trade, is not used because all missing values in the underlying database refer to three countries, Lithuania, Liberia, and the Bahamas. Because the trade data are completely missing for those countries, it seems justified to exclude the observations (Bacchetta, 2012). The advantage of dropping the missing observations and still applying the log version of the model is that the estimates of the fixed-effects model and the Poisson equation remain comparable. Based on the literature review, the following signs of the estimators are expected:

Table 1. Expected Sign of the Estimators

Variable	Sign
GDP Exporter	+
GDP Importer	+
Distance	-
EU-KOR FTA	+

The underlying panel data set comprises data on Korean exports to 50 trading partners for the years between 2000 and 2015, 800 observations in total. Based on Fig. 2, which shows different trends among the export sectors, this paper follows the literature and analyzes the effects for disaggregated export data (*e.g.*, Hatab *et al.*, 2010; Yang and Martinez-Zarzoso, 2014; or Gashi *et al.*, 2017). As predictive studies, done before the enforcement of the FTA in 2011 estimated that in terms of trade South Korean manufacturers of cars and chemical products would increase their exports to the EU market the most (Cooper, 2011). The focus of this study is on one hand on the total exports but also on the other, it is on the machinery, chemical, and transport equipment sectors because these are the most promising market sectors for finding positive trade effects for South Korea (Forizs and Nilsson, 2017). The disaggregated trade flows thus refer to the following International Standard Industrial Classification industry codes:

- 23T25: Chemical, Rubber, Plastics and Fuel Products
- 29T33: Machinery and Equipment
- 34T35: Transport Equipment

As mentioned in the introduction, the underlying dataset leads to a potential problem. Fig. 1 shows that the temporary introduction of the agreement coincides with the 2011 euro crisis. Since the crisis has had a long-term impact on the European economy, it is likely that the estimator of EU-KOR FTA dummy suffers from a negative bias in a sense that the effect would be larger in times of a stable European economy. This should be taken into account by evaluating the estimation results. Further, the crises could lead to unexpected findings compared to the Literature, which mostly expects positive trade effects.

The total export flow data were collected from the International Monetary Fund's *World Economic Outlook*, and the disaggregated sectoral exports flows were gathered from the OECD database. Further, the data sets include data from the Centre d'Etudes Prospectives et d'Informations Internationales, namely from the GeoDist (Mayer and Zignago, 2011) and Gravity (Head *et al.*, 2010) data sets. The following summary statistics present a raw overview of the structure of the data. Table 1 shows that there were fewer observations for sectoral exports, which was linked to missing data for trade between South Korea and Lithuania,

Liberia, and the Bahamas. It should be noted that all values are presented as total values and not as logarithmic transformation; this was to allow for a more intuitive overview of the data. Table 2 shows that for 125 country-pairs (roughly 15 % of the observations), the EU-KOR FTA dummy— the variable of interest—took the value of one.

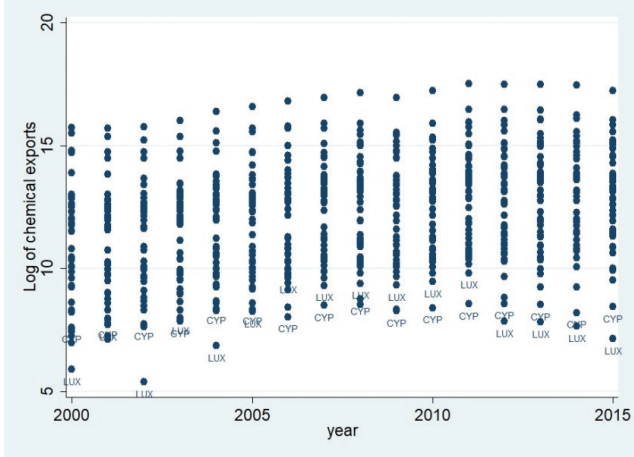
Table 2. Summary Statistic

	Mean	Min	Max	N
Tot. exports	6.28e+09	4779121	1.46e+11	800
Chemical exports	1390795	216.624	3.97e+07	752
Transport equipment exports	1117924	3.259	2.61e+07	752
Total value of machinery exports	2957109	152.345	8.60e+07	752
GDP Ex.	9.81e+11	5.33e+11	1.41e+12	800
GDP Im.	9.68e+11	4.09e+08	1.80e+13	799
Distance (most populated cities, km)	8161.175	955.6511	18375.18	800

4. Findings

This chapter presents the estimation results of equation (1). As a baseline model, Table 3 shows the results of a pooled OLS estimation. Further, following the literature (Baldwin and Taglioni, 2007), a fixed-effects estimation is applied taking the unobserved MTR terms into account (Table 4). Finally, a PPML estimation is used to appropriately control for the underlying heteroscedasticity of the trade data (Silva and Tenreyro, 2006). In addition to the regression results, all necessary test statistics are reported in the tables and discussed below. It should also be noted that the observations for the import countries Luxembourg and Cyprus were excluded because of an outlier problem, which can be seen for example in the chemical exports data in Fig. 3; the exclusion can also be justified because of the special economic and political status of both countries. Table 3 and Table 4 present the results for the pooled OLS and fixed-effects estimations.

Fig. 3. Scatterplot of the Log of the Chemical Exports



Source: OECD CRS (2017).

Table 3. OLS Estimation

	(1) Log of Total exports	(2) Log of chemical exports	(3) Log of transport eqpt. exports	(4) Log of machinery exports
Log Ex. GDP	1.321***	1.461***	1.337***	0.472
	(5.15)	(5.36)	(4.18)	(1.58)
Log Im. GDP	0.534***	0.776***	0.683***	0.847***
	(16.74)	(33.90)	(17.61)	(34.12)
Log Dist	-0.930***	-1.489***	-0.201***	-1.368***
	(-15.23)	(-16.34)	(-2.93)	(-17.42)
Colony	-0.522***	-1.371***	-1.521***	-2.103***
	(-3.19)	(-7.42)	(-8.57)	(-13.26)
Language	1.165***	0.584***	0.920***	0.446***
	(11.34)	(5.63)	(7.33)	(4.65)
EU-KOR FTA	-0.915***	-0.702***	-0.388**	-0.557***
	(-6.47)	(-4.70)	(-2.30)	(-3.32)
Constant	-20.95***	-35.14***	-40.52***	-9.989
	(-2.95)	(-4.66)	(-4.60)	(-1.22)
N	767	719	719	719
BP-test $\chi 2$	154.12	23.40	133.98	34.89
vce	Robust	robust	robust	robust
Year dummies	Yes	Yes	Yes	Yes

Notes: 1. t statistics in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

GDPs and distance show expected result, with positive and negative coefficient, respectively. The negative coefficient for Colony dummy implies that week Yen under Abenomics and some disagreements in politico-diplomatic affairs adversely caused the two countries' trade volume, particularly since the EU-Korea FTA took effect[2]. it is only noted that the EU-KOR FTA dummy has a strong significant negative effect on all export sectors. This finding can be mainly linked to the economic recession of the EU during the implementation of the FTA. Also, the fluctuating won/euro exchange rate in and some Korean companies' offshoring its production bases to Eastern Europe (*e.g.* Hyundai-Kia) could be additional contributing factors for this result[3]. It should further be noted that there are more observations for the total exports; this is because there are observations in these data for Lithuania, Liberia, and the Bahamas, which was not the case for the sectoral export observation. Because the results of OLS estimation are highly likely to be distorted, a more in-depth interpretation based on the fixed effects with additional remoteness terms and year dummies, which takes time-invariant country-pair effects, collective and individual time effects into account is a more appropriate approach.

Results from the Breusch-Pagan test as well as a modified Wald test for groupwise heteroscedasticity indicated that the assumption of homoscedasticity was violated; to overcome this problem, robust standard errors were calculated. Further, results from an F test for the joint significance of the year dummies suggested that there were unobserved time effects in the model approach, and thus, year dummies were included in the estimation.

[2] We appreciate insights from an anonymous reviewer.
[3] We appreciate insights from an anonymous reviewer.

Wooldridge (2010) stated that the Hausman test, which is usually used to decide whether a fixed- or random-effects model is preferable, can fail under certain assumptions. Therefore, an alternative test for identifying restrictions has been applied (Nichols, 2007): The Sargan-Hansen statistic, the result of this test, indicated that the fixed-effects approach was preferable. This result was in line with the literature findings (Kepaptsoglou *et al*., 2010).

Table 4. Fixed Effects Estimation Results

	(1) Log.Total exports	**(2) Log. chemical exports**	**(3) Log. transport eqpt. exports**	**(4) Log. machinery exports**
Log Ex. GDP	0	0	0	0
	(.)	(.)	(.)	(.)
Log Im. GDP	0.856***	0.607***	0.771**	1.337***
	(3.93)	(2.89)	(2.21)	(4.78)
EU-KOR FTA	0.145	0.383**	-0.00464	0.0927
	(0.82)	(2.27)	(-0.02)	(0.36)
Remoteness ex.	-0.174	-0.495***	-0.387	0.189
	(-1.48)	(-3.51)	(-1.66)	(1.11)
Remoteness im.	0	0	0	0
	(.)	(.)	(.)	(.)
Constant	3553035.9	10094092.8***	7898194.6	-3853478.1
	(1.48)	(3.51)	(1.66)	(-1.11)
N	767	719	719	719
N Groups	48	45	45	45
r2 overall	0.302	0.303	0.489	0.426
BP test $\chi 2$	104.99	9.55	137.96	34.75
Wald test $\chi 2$	17504.86	5290.49	6758.21	12442.91
F-test	5.25	7.43	3.14	2.97
Sargan-Hansen χ^2	53.264	87.107	22.044	34.028
Vce	cluster	cluster	cluster	cluster
Year dummies	Yes	Yes	Yes	Yes

Notes: 1. *t* statistics in parentheses.
2. $*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$.
3. Due to the country-pair fixed effects, all country-pair specific variables (distance, colony and language dummies) that did not vary over time were omitted from the regression output (Yang and Martinez-Zarzoso, 2014).

It should be noted that the log-log relations within the model can be interpreted as elasticities and that the estimations for the dummy variables can be interpreted as the percentage changes. Following this interpretation, the fixed-effects estimation indicated that a 1% increase in the importers GDP ceteris paribus (CP) increased the Korean exports between 0.607% and 1.337% depending on the export sector. Total exports increased by 0.856% CP when the importers' GDP increased by 1%.

Focusing on the variable of interest, the EU-South Korean FTA dummy, the estimation results show that the FTA only had a significant effect on exports from the chemical sector. The model suggests that under the agreement, chemical exports are CP 38.3% higher than were exports to non-member countries. Regarding the total exports and the other industry sectors, the results did not show a significant impact of the FTA. Again, it should be noted that the insignificance of the FTA dummy is most likely to occur because of the economic recession of the EU during the FTA implementation. However, the significant, positive effect

on the chemical exports shows that some sectorial exports increased despite the crisis. Because of the implementation of year dummies and remoteness terms, this positive effect can be clearly linked to the FTA.

These findings are partly in line with those of Juust et al. (2017), who found that the trade-enhancing effects of the FTA in the car trade were substantially higher for the EU than for South Korea. Further, this study's findings fit Kose and Riezman's (2002) theory that the effects of FTAs between small countries and customs unions are smaller for the small countries because they have to compensate the union members. Table 5 presents the results for the pseudo PPML estimation, which considered the underlying heteroscedasticity of the data more appropriately than did only calculating robust standard errors (Bacchetta, 2012).

Table 5. Pseudo Poisson Maximum Likelihood Estimation Results

	(1) Log of Total exports	(2) Log of chemical exports	(3) Log of transport eqpt. exports	(4) Log of machinery exports
Log Ex. GDP	0.0158	0.0759***	0.0714**	-0.0383
	(1.47)	(2.92)	(2.15)	(-1.53)
Log Im. GDP	0.0422***	0.0550***	0.0692***	0.106***
	(4.27)	(2.83)	(2.67)	(5.29)
EU-KOR FTA	0.0102	0.0475***	0.00873	0.0135
	(1.20)	(3.25)	(0.40)	(0.68)
N	767	719	719	719
N Groups	48	45	45	45
vce	robust	robust	robust	robust
Year dummies	Yes	Yes	Yes	Yes

Notes: 1. *t* statistics in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The first striking point in comparing the results from the FE and PPML estimations was that all coefficients of the PPML approach were smaller; this finding is supported by the literature (see, e.g., Silva and Tenreyro, 2006). According to the PPML estimation, the chemical sector was again the only export sector that was significantly affected by the FTA. The estimation implies that the FTA increased South Korea's chemical exports to Europe CP by 4.75% compared with the exports the non-member countries. Taking into account the euro crisis in 2011 which coincides with the implementation of the free trade agreement, the insignificant results are not surprising. Accordingly, the positive effect on chemical exports is even more striking and underlines the potential of the sector in the future. A complete econometric evaluation of the trade agreement will only be possible after the EU has recovered from the recession. As long as some European economies suffer from the Euro crises, the estimation of the FTA impact will be negatively biased.

In conclusion, the results from the two panel estimations underline that the coefficients from OLS estimation are biased and should be handled with caution. Further, the results suggest that the European Union-South Korea Free Trade Agreement has only affected the chemical exports of South Korea.

5. Conclusion

This study finds that the EU-South Korea FTA only affected the exports of chemical products. Fixed-effects estimation predicted a positive trade effect of 38.3% of the FTA, whereas PPML estimation predicted an effect of 4.75% in chemical exports. For the other

sectors that were part of these analyses as well as for the total exports, the regression results only show insignificant effects. This is consistent with European Commission (2018)'s finding that Korea's export to EU in chemical sector has doubled from 3 billion euro to 6 billion euro over the past 4 years.

One thing that should be addressed is the recent formal signing between Japan and the EU for the Economic Partnership Agreement where high tariffs of chemical sectors (as high as 6.5%, mostly from *HS Code 39 – Plastics and Articles Thereof*) will be immediately eliminated (KITA, 2018). This is particularly important for Korea who's Export Similarity Index with Japan is quite high. Especially in front of the background, that the Korean government changed its trading policy towards bilateral trade agreements because of the increasing competition from Chinese and Japanese companies (Cooper, 2011), the findings of this paper highlight that the Korean Government should focus on sector-specific programs to maximize the welfare benefits of the free trade agreement and to ensure competitiveness in the global market.

Econometrically, findings of this paper should be treated with caution. Owing to the structure of the data with only one exporting country, it was impossible to use the standard approach of time-varying import and export dummies to control for the unobserved MTR (Gashi *et al*., 2017). The approach used in this paper, using a proxy for the remoteness of the import and export country, has been criticized because it only considers MTR, which is related to distance (Anderson and van Wincoop; 2003). Further, the FTA estimation is most likely negatively biased because of the Euro Crises which coincides with the implementation of the Agreement in 2011. Finding a more suited approach will be reserved as a future research topic.

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