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EU ENLARGED COUNTRIES' TRADE WITH EAST ASIA: OUTLIERS IN EXPORT AND IMPORT TIME SERIES

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Abstract

From the standpoint of EU enlarged countries, this empirical study investigates the trade relationship with East Asia via an outlier approach in export and import time series. The results show the exports in trial-and-error progress compared to the imports in a developed adjustment. The outlier patterns clearly demonstrate the divergent trade relationship between the sample countries. This study makes a contribution to the outlier approach in the context of international trade. It concludes that the deeper incorporation of EU enlarged countries into East Asia can lead to significant involvement in the global supply chain and highlight the sustainability of economic growth.

Keywords

Bilateral Trade; East Asian Countries; EU Enlarged Countries; Outlier Approach

JEL Classification: C22, F14, O57

I. Introduction

The EU enlarged countries (EECs)[1] have caught up rapidly with the EU15[2] , known as a laboratory for competitiveness enhancement (Comes et al. 2018). The productive structure is transferring from low-tech to high-tech products through foreign direct investment (FDI) to consolidate the position in the global supply chain (Soukiazis et al. 2017; Damijan et al. 2018). It goes without saying that the huge leverage of economic transition comes from the EU15, as Balcerowicz (1994) addresses that only 2% of EU15's total imports could pull more than 50% of EECs' total exports. Bideleux (2011) considers, however, that most of EECs' 'emerging economies' became 'submerging economies' after the global financial crisis in 2008-2010. The subsequent European debt crisis lead the whole EU economy into turmoil, which was followed by incidents of terrorism, a refugee crisis, Brexit, the ongoing COVID-19 and Russo-Ukrainian war . Bohle (2018) explains that FDI is no longer a core of EECs' new growth in the post-crisis environment. Drahokoupil and Galgóczi (2015) even caution that the golden era of FDI in EECs is over. Furthermore, Beugelsdijk et al. (2018) explore the limited diffusion of technology and of efficient production practices between EECs and the EU15. Jacoby (2010) argues the EEC-EU15 paradoxes of capital investments, labour migration and trade patterns. As can be seen, EECs need to seek different trajectories for economic prosperity.

Meanwhile, China was ambitious in reinforcing the vital role of EECs through the '16 + 1 framework' in 2012 and the 'One Belt One Road' in 2016 (Góralczyk 2017; Matura 2019). Song (2017) underlines that China's relations with EECs are from 'old comrades' in the communist past to new partners in the context of globalisation. Whether it is a 'China threat' or a 'China opportunity' (Pavlićević 2018), the fact is that the external trade of EECs is dynamically shifting to East Asia, especially for exports (Tseng 2017). Dzikowska et al. (2017) propose that trade reorientation can facilitate economic growth on the evolution of Poland's position in the global economy. East Asia encompasses not only China but many other potential trade partners, which may provide an alternative opportunity for EEC trade expansion. Therefore, this study attempts to configure the EEC global vision and interest beyond the EU into East Asia, though of an insufficient research for bilateral trade relationships between EECs and East Asian countries (EACs) (see Table 1).

[1] The EECs are the member countries of the European Union (EU) enlargement in Central and East Europe.
[2] The EU15 represents the early EU members prior to the enlargement on 1 May 2004.

Country Name	Country Code	Land area (sq. km)	Population	GDP (current million US$)	GNI per capita* (current US$)	Trade (% of GDP)
EU Enlarged Countries (EECs)						
Bulgaria	BG	108,560	7,025,037	65,133	8,860	131
Czechia	CZ	77,220	10,629,928	245,226	20,230	150
Estonia	EE	43,470	1,321,977	30,732	21,130	145
Hungary	HU	90,530	9,775,564	157,883	14,760	166
Latvia	LT	62,180	1,927,174	34,409	16,500	123
Lithuania	LV	62,642	2,801,543	53,429	17,360	149
Poland	PL	306,190	37,974,750	585,664	14,100	108
Romania	RO	230,080	19,466,145	239,553	11,300	86
Slovenia	SI	20,142	2,073,894	54,008	24,500	162
Slovakia	SK	48,080	5,446,771	105,905	18,260	190
East Asian Countries (EACs)						
China	CN	9,388,210	1,392,730,000	13,608,152	9,460	38
Hong Kong	HK	1,050	7,451,000	362,682	50,300	377
Indonesia	ID	1,811,570	267,663,435	1,042,173	3,840	43
Japan	JP	364,560	126,529,100	4,971,323	41,310	37
South Korea	KR	97,489	51,606,633	1,619,424	30,620	83
Malaysia	MY	328,550	31,528,585	358,582	10,590	131
Singapore	SG	709	5,638,676	364,157	58,770	326
Thailand	TH	510,890	69,428,524	504,993	6,610	123
Taiwan	TW	36,197	23,580,080	608,186	26,376	102
Vietnam	VN	310,070	95,540,395	245,214	2,360	208

TABLE 1—BASIC DATA OF EECS AND EACS IN THIS STUDY

Note: * Except for Taiwan, all data are in the origin of World Bank; * Atlas method for World Bank data.

Source: World Bank; Taiwan Statistical Bureau.

Many studies confirm that the division of labour and complementarity between EECs and the EU15 boost the EU's total factor productivity and international competitiveness (Orlic et al. 2018). East Asia is labelled as a 'world factory' and theoretically may bring about some cooperation or interaction with the transformed EECs. Indeed, it raises the issue that EECs are competitors to EACs in the global supply chain (Fung et al. 2009; Silgoner et al. 2015); the production linkage of Asia and Europe is via EECs (Ando and Kimura 2013); and some EEC trade relationships focus on China (Cieślik 2019). However, the indefinite conclusions result in small amounts of EEC-EAC trade along with scarce advance research interested in these topics. In the 16 years between 2004 and 2019, EACs accounted for less than 3% of EECs' total exports and about 10% of EECs' total imports. Pomfret and Sourdin (2018) demonstrate the greater global value-chain participation of EACs compared to EECs. Additionally, EECs are dubbed as dependent market economies (Nölke and Vliegenthart 2009; Drahokoupil and Piasna 2019), heavily relying on foreign ownerships headquartered outside of EECs. This suggests that the supply chain of EECs is involved rather in Europeanisation than globalisation. Nonetheless, the EECs' entrepreneurship, under the EU environmental pressure for sustainable development, could create better innovation than the EACs. Trade can exert a significant impact on incentives for innovation through an encounter between EECs and EACs.

Caputo et al. (2016) summarize that the motivation of international marketing expansion for EEC firms is still low because of resource and capability limits through an inter-disciplinary literature review of internationalisation. Not surprisingly, the EEC trade deficit with EACs steeply rose from €10 billion in 1999 to €20 billion in 2004 to €71 billion in 2019, based on Eurostat. On the whole, the growth trends both for exports and imports are strongly positive, according to the statistical analysis in Table 2. It must be emphasized, however, that the ratio of exports to imports was 0.1436 in 1999 and increased to 0.2338 in 2019. Overall, the export distribution is fairly different to the imports. The export skewness was -0.1534 for the period of 2004-2019, while the import skewness was 0.3238. Undoubtedly, China constitutes the main part of the East Asian market; the import share rose from 24% in 1999 to 61% in 2019, while the export share rose from 18% to 48% in that same time. At the same time, decreased shares in imports appeared in Japan, falling from 27% to 6%, and in Taiwan, falling from 10% to 3%. The significantly decreased shares in exports are Singapore from 25% to 6% and Taiwan from 11% to 3%. Interestingly, the ratio of exports to imports for Singapore and Hong Kong have been higher than one since 2004, respectively gathering in 2013-2019 and 2004-2007. On the side of EECs, Slovakia's exports to EACs increased from less than 3% in 1999 to 11% in 2019 by the share of EECs. Additionally, its imports increased from 4% to 9%. Hungary signifies import stagnation in 2004-2019 with an insignificant R-squared value, 0.2296, and a low coefficient of variation (CV), 16.99 (see Table 2). Yet, Lithuania's exports reached a comparatively high CV, 81.25. Broadly speaking, the bilateral trades are so volatile that the determinants are highly variable across the sample countries. Bruszt and Vukov (2017) elaborate that EECs have taken radically different developmental pathways and faced different dilemmas, resulting in divergent patterns of insertion in the global market.

Country	Export		Import	
	R^2	CV	R^2	CV
BG	0.8683	54.20	0.6231	34.57
CZ	0.9741	49.31	0.9282	45.74
EE	0.7378	51.00	0.5829	27.04
HU	0.8209	34.75	0.2296	16.99
LT	0.5803	81.25	0.8054	36.60
LV	0.9585	62.20	0.9058	44.43
PL	0.9626	46.56	0.9440	48.50
RO	0.8939	47.36	0.7551	30.73
SI	0.8668	70.60	0.9394	48.35
SK	0.7945	52.72	0.8339	36.98
EECs	0.9719	46.09	0.9266	36.21

TABLE 2—THE TREND AND VARIATION OF EEC EXPORTS AND IMPORTS IN THE EAC MARKET BETWEEN 2004 AND 2019

Note: (1) $\boldsymbol{R-squared\ value}\ (\boldsymbol{R^2}) = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}}$

where x is the year; y is an export or import value; $\bar{x}$ and $\bar{y}$ are the sample means.

(2) $\boldsymbol{Coefficient\ of\ variation}\ (\boldsymbol{CV}) = \frac{standard\ deviation}{mean} \times 100$

This study takes up the challenge of investigating these international trade volatilities, which may be associated with complex exogenous and endogenous factors in the sample countries (Smętkowski 2018). Intuitively, the EAC market is a great opportunity for EECs, but the EEC market is sort of an accident for EACs. It seems a fair inference that outliers would occur frequently in these export and import time series, which may be hard to factorize by traditional trade theories such as the gravity model or the Heckscher-Ohlin model. Hence, the outlier approach could be a better way to discover the trade path when a theory does not work perfectly (Nare et al. 2012).

The remainder of the paper is organized as follows. The next section discusses in more detail the outlier approach and the data. The third section undertakes the empirical results of outlier analysis. The final section concludes with a brief implication for the trade prospects between EECs and EACs.

II. Methodology

Outlier analysis has attracted abundant research from various scientific domains for over a century. Anscombe (1960) states that numerous criteria for outlier detection have been debated during the past 100 years. The classic book by Barnett and Lewis, Outliers in Statistical Data, notes that there were 300 more outlier papers published in the period from the first edition in 1978 to the second in 1984. The third edition in 1994 contains about 1,000 references because more than 1,000 new articles about outliers appeared over the nine years preceding this edition. In fact, the definition of outliers is not uniform but takes shape under a given context or application. For instance, Modi and Oza (2016) point out 12 methods of outlier definition. This study follows the very first definition of outlier (Akoglu et al. 2015) by Hawkins (1980), 'an observation which deviates so much from other observations as to arouse suspicions that it was generated by a different mechanism'. Wainer (1976) underlines the outlier concept of 'fringeliers', unusual events that occur more often than seldom. This study's aim is to disclose the different mechanisms of outliers in exports and imports among the sample countries.

The typical treatment of outlier is 'Winsorization', assigning them lesser weights or modifying them to be closer to the other sample values (Grubbs 1969). This study, however, does not deem outliers as contaminants but as valuable objects to explain complex, real-world phenomena. Indeed, it is not easy to draw a model for sophisticated human behavior. The traditional usage relies on arbitrary 'dummy' variables to simulate historical and political factors. This study attempts to gain insight into invisible facts through an outlier approach. Tsay (1988) also says that the procedure for detecting outliers can be useful to perceive some special features hidden in a time series. There may be hundreds of approaches to detect outliers, which depend heavily on the analysis purpose and data type (Aggarwal 2017; Hodge and Austin 2004; Modi and Oza 2016). This study utilizes international trade statistics in goods from the qualified Easy Comext database of Eurostat, covering monthly import (i) and export (e) values in Euros from 2004-2018. It is worth noting that this study does not take into account the Covid-19 pandemic which has severely disrupted the patterns of international trade since 2019. The 10 EECs are implemented as reporters and 10 EACs as destination partners, amounting to 200 trade series with 180 data points for each.

The successive trade data are known as the typical time series with seasonal characteristics. Balke and Fomby (1994) mention that a univariate time series model is more conservative to identify outliers than a multivariate model. The useful autoregressive integrated moving average (ARIMA) model is often adopted for outlier detection in time series research. Thus, this study applies the univariate ARIMA model to detect outliers, based on Box and Jenkins (1976). The shorthand notation for this study is ARIMA(p,d,q)(P,D,Q)s, where p is the

non-seasonal AR order, d is the non-seasonal differencing, q is the non-seasonal MA order, P is the seasonal AR order, D is the seasonal differencing, Q is the seasonal MA order, and s equals 12 repeating seasonal patterns.

For brevity, this study illustrates the parsimonious ARIMA (p,d,q) model as the following (SAS 2017):

$$\boldsymbol{D(B)Y_t = \mu_t + \frac{\theta(B)}{\phi(B)} a_t} \qquad \textbf{(1)}$$

where Y_t is the response series at time t; D(B) is the differencing polynomial in the backward shift operator B; μ_t is the transfer function input; ϕ(B) and θ(B) are the AR and MA polynomials, with orders p and q, respectively; and a_t is the Gaussian white noise series.

In the empirical literature, selecting appropriate values for ARIMA orders can be difficult. This study's strategy is based on the idea that there are 864 ARIMA(p,d,q)$(P,D,Q)_{12}$ models established for each series to automatically determine the better ones under the same criteria, with p = 0,1...5; d = 0,1,2; q = 0,1...5; P = 0,1; D = 0,1; Q = 0,1. The diagnostic criteria of adequate models are that all the parameter estimates are significant at a 5% level and the residual series is white noise. When no models are relevant in a given time series, the natural logarithm is calculated for the transformation of arithmetic data. At last, the lowest Akaike information criterion decides on the best model from among the adequate models in a given series.

The fitted ARIMA model is then incorporated to automatic outlier detection by using the SAS/ETS software package. The outlier, a shock signature (η_t) at time t, is testing H_0:β=0 versus H_a:$\beta\neq$0 in the model (SAS 2017):

$$\boldsymbol{D(B)(Y_t - \beta\eta_t) = \mu_t + \frac{\theta(B)}{\phi(B)} a_t} \qquad \textbf{(2)}$$

This study detects outliers by using a maximum-likelihood estimate and a stricter significance level of 1%. In order to examine any outlier completely, there is no limit to the number of outliers to be searched. More importantly, the estimation of outliers can cause either a positive or a negative effect. According to SAS specification, three types of outliers are distinguished by the persistence on the time series (SAS 2017):

An additive outlier (AO) at some time point s corresponding to a shock signature is defined as

η_t = 1 for $t = s$,

η_t= 0 for all other time points.

A level shift (LS) originating at time s with a shock signature is defined as

η_t= 1 for $t >= s$,

η_t= 0 for $t < s$.

A temporary change (TC) of duration d originating at time s is defined as

η_t= 1 for $s <= t <= s + d$,

η_t= 0 for all other time points.

An AO views a sudden break with only a one-shot effect on the series. An LS allows a gradual change that permanently affects the subsequent level of a series. A TC is a spike that takes a few periods to disappear exponentially. This study distinguishes six-month and 12-month periods for TCs, denoted as T6 and T12. Moreover, a TC may be a generalisation of AO or LS (Chen and Liu 1993), abbreviated to AOT6, AOT12, LST6 and LST12 in this study. This study categorizes five outlier groups: AOGs, including AO, AOT12 and AOT6; LSGs, including LS, LST12 and LST6; T6Gs, including T6, AOT6 and LST6; T12Gs, including T12, AOT12 and LST12; and TCGs, including T6Gs and T12Gs. Simultaneously, the positive and negative effects of outliers are involved in the analysis.

In the course of international trade, generally, the presence of more outliers may be regarded as bilateral trade blooming or the initial marketing of trial and error. Fewer outliers could indicate either steady growth or an undeveloped market. Tolvi (2001) notes that it is difficult to think of potential explanations for most outliers in terms of trade series. In a single case, it is not easy to illustrate the deeper significance of outliers. This study draws comparative perspectives on 200 series under the equal background and statistic criteria to highlight the trajectory of the trade relationship between EECs and EACs. Monastiriotis et al. (2017) demonstrate EEC disparities between growth effects and EU association by an event-analysis approach. Certainly, this study investigates clustering outliers by historical events, but limiting based on EU enlargements, the global financial crisis and the European debt crisis.

This study analyses the frequency, timing and persistence of outliers from the macro, meso and micro perspectives. The macro level is a rough sketch of outlier behavior across series. The meso level describes outliers in a country towards the destination market or the reporting countries. The micro level discerns the significant patterns of outliers for the country-to-country trade relationships in 200 cases. Basic descriptive statistics are used to overview the outlier configuration. The CV for the period 2004-2018 is inspected to better compare outlier volatility across series. In sum, this study takes the standpoint of EECs to evaluate the trade relationship with EACs via a comparison of outlier behavior.

III. Empirical Results

Our model-selecting strategy efficiently and successfully detected the 200 best ARIMA models from 17,280 preset models. The most frequent models are ARIMA(1,2,2)$(0,1,1)_{12}$, ARIMA(0,1,1)$(0,1,1)_{12}$ and ARIMA(1,0,1)$(0,1,1)_{12}$, accounting for 33 (16.5% of the total 200 models), 17 (8.5%) and 11 (5.5%), respectively.

The export ARIMA models perform in nonseasons much more than the imports (30 and 14 models, respectively). On the side of destination countries, the nonseasonal ARIMA models display in every export time series more or less. The import ARIMA models by Korea and Taiwan are totally seasonal. Likewise, the logarithmic transformations in exports are more than the imports, 17 and 10, respectively. The export models for Vietnam are the most logarithmic with four models. On the side of reporting countries, the most nonseasonal models are the exports by Latvia and Slovakia, both accounting for six models, while their import models are totally seasonal. The other totally seasonal pattern is Lithuania's exports. Slovenia produces the most logarithmic patterns both in exports and imports, with four and three models, respectively. Consequently, these different patterns between exports and imports allude to the divergent prospect of bilateral trade relationships between the sample countries.

On the macro level of analysis, the detected outliers yield up to 3,981 observations, 11.02% of the total 36,000 observations. The outliers in exports are obviously more dynamic than the imports, respectively 2,093 (52.57% of total outliers) and 1,888 (47.43% of total outliers). The 2004-2018 CVs for outliers are 29.09 for exports and 20.58 for imports. The ranges of total outliers are from 3 to 51 in the 100 import models and from 6 to 45 in the exports. The negative outliers are found more in imports than in exports, respectively 683 (36.18% of total imports) and 590 (28.19% of total exports). In particular, the negative LSGs of imports are noticeable, 313 against 295 in positives, while the exports are 191 against 313. And the LST12s share a relatively large part of the negative LSGs in imports, accounting for 26.84%. The positive AOGs of exports arise apparently, with 68.40% in total positive outliers for exports and 40.31% for imports. These figures indicate the exports in aggressively trial-and-error progress compared to the imports in a developed adjustment.

As expected, the outliers substantially coincide with the historical events of the study period of 2004-2018. There were 80 negative outliers of imports in 2004, 11.71% of total negative outliers of imports in 2004-2018. The worst was 51 negative LSGs contained, or 63.75% of these 80 negative outliers of imports. It may be of some interest to note that joining the EU for EECs did not bring in prominent trade relationships with EACs, identified by Fligstein and Merand (2002) as evidence of Europeanisation instead of globalisation. Not surprisingly, the global financial crisis strictly hit the imports in 2008-2009. The negative LSG outliers of imports rose up to 37 in 2008 and 36 in 2009, two historic peaks since 2005. The 2009 negative outliers of imports show even more than the positives, respectively 58 and 48. In sharp contrast, the positive LSG outliers of exports started to surge in 2009, from around 10 before 2009 to 22 in 2009 to 33 in 2010. Indeed, the export outliers have skyrocketed since 2010, especially positive outliers. There were 1,514 export outliers in 2010-2018, 72.34% of total export outliers in 2004-2018. The results suggest that the European debt crisis caused the EU economic recession but fostered marketing prospects in East Asia. It is perhaps worth it for EEC policymakers to accelerate the relationship trajectory with EACs in order to sustain economic expansion and move forward on globalisation. Karo and Kattel (2015) use 'smart specialisation' as an approach for policy implementation and public-private coordination of entrepreneurial discovery in EECs.

On the meso level of reporting countries, Czechia is the only one yielding import outliers more than the exports (see Table 3). Its import outliers happened in the extreme, 262 compared to 180 on average for the other EECs. The import LSG outliers share 40.84% of its total import outliers, far over the 30.86% average of the other EECs. It is likely that the developments of major Czech industries, electrical, machinery and automobile, correspond to supplies from East Asia. Additionally, the export outliers represent the highest CV in EECs, especially active after 2012 (see Table 4). The intra-industrial trade obviously occurs in a bilateral trade perspective. Contrastingly, Hungary is the only country with negative outliers that exceed the positives in both exports and imports. The negative LSG outliers of exports occupy 51.72% of its total export LSGs, the highest in the EECs. The seasonal export outliers are also the highest, at 43.6% of its total exports with significant negatives compared to the other EECs. These results reflect Hungary's economic recessions and difficulties, although its major industry is electronics, similar to East Asia. The outliers of Poland arose both in exports and imports after the global financial crisis. The export outliers have markedly increased since 2011, as have the import outliers since 2012. The positive export outliers expose the highest share compared to the other EECs, 82.54% of its total exports. This implies that Poland has moved quickly towards the East Asian market in response to the sluggish EU economy. Slovakia exhibits a CV of import outliers exceeding that of exports, which is distinct from the other Visegrád countries. The main reason is that the export outliers have been numerous since 2005, suggesting the unstable condition of exports. The import seasonal outliers make up the highest share compared to the other EECs, 45.21% of its total import outliers.

Effects/ Reporting Country	AO	AOT12	AOT6	LS	LST12	LST6	T12	T6	Total
Export	1067	92	136	344	68	92	111	183	2093
+	836	79	113	203	32	78	59	103	1503
BG	86	20		26			10	19	161
CZ	91	12	10	21	2	6	5	6	153
EE	80	6	17	18	2	6	6	8	143
HU	71	12	16	18	2	8	4	10	141
LT	89	5	13	16	12	16	8	13	172
LV	60	8	7	32	2	14	5	10	138
PL	100	4	20	18	2	2	2	8	156
RO	83		12	18	2	8	6	8	137
SI	60	4	8	15	2	10	10	9	118
SK	116	8	10	21	6	8	3	12	184
-	231	13	23	141	36	14	52	80	590
BG	26	2		13	4		8	10	63
CZ	10	2		10	2	2	6	10	42
EE	19		1	13			4	9	46
HU	16		4	14	10	6	10	10	70
LT	25	1	7	17	4	4	4	10	72
LV	49	6	3	17	10		5	7	97
PL	10		2	10	2		4	5	33
RO	29		2	20	2		2	4	59
SI	28		4	8		2	6	7	55
SK	19	2		19	2		3	8	53
Import	802	106	102	370	136	102	110	160	1888
+	591	92	78	169	52	74	58	91	1205
BG	77	18		17	6		5	21	144
CZ	63	12	6	32	14	16	4	6	153
EE	49	8	6	16		4	9	12	104
HU	39	4	4	19	6	8	9	5	94
LT	51	8	10	23	4	6	7	5	114
LV	68	10	21	9	2	4	5	7	126
PL	60	14	6	15	4	8	3	9	119
RO	78	6	4	11	4	2	5	9	119
SI	62	4	13	14	2	8	5	7	115
SK	44	8	8	13	10	18	6	10	117
-	211	14	24	201	84	28	52	69	683
BG	21			19	4		5	11	60
CZ	48			31	10	4	9	7	109
EE	19	6	2	24	8	4	7	6	76
HU	25	4	4	24	10	6	8	7	88
LT	16	2	4	18	6	2	4	5	57
LV	15		1	23	4		5	12	60
PL	16		2	9	18	6	5	6	62
RO	16		2	22	10	2	2	6	60
SI	9		5	11	4	2	3	6	40
SK	26	2	4	20	10	2	4	3	71
Total	1869	198	238	714	204	194	221	343	3981

TABLE 3—EXPORT AND IMPORT OUTLIERS IN 2004-2018 BY REPORTING COUNTRIES, OUTLIER EFFECTS, AND OUTLIER TYPES

Source: Author's own work.

	BG	CZ	EE	HU	LT	LV	PL	RO	SI	SK
Export	224	195	189	211	244	235	189	196	173	237
2004	2	1	10	10	8	14	16	19	6	4
2005	8	4	10	3	6	11	3	14	6	13
2006	16	1	20	8	1	8	9	8	12	14
2007	11	9	18	4	8	6	6	11	2	10
2008	9	12	18	12	7	13	11	18	12	18
2009	4	3	10	13	7	16	7	10	11	18
2010	17	11	12	25	7	25	9	10	10	17
2011	16	8	12	34	16	22	16	11	8	18

	BG	CZ	EE	HU	LT	LV	PL	RO	SI	SK
2012	18	22	12	14	15	14	19	15	12	30
2013	29	15	13	9	25	8	24	10	7	15
2014	18	13	10	10	18	26	18	5	9	14
2015	27	20	10	17	27	24	21	6	13	22
2016	25	17	7	17	32	12	13	23	24	15
2017	14	33	13	16	26	21	7	19	18	13
2018	10	26	14	19	41	15	10	17	23	16
CV	0.5312	0.7222	0.2858	0.5658	0.7129	0.4148	0.4872	0.4044	0.5313	0.3598
Import	204	262	180	182	171	186	181	179	155	188
2004	4	22	29	25	10	4	15	7	6	12
2005	5	3	22	6	8	3	6	9	13	6
2006	11	6	21	4	19	8	8	16	7	7
2007	29	4	9	13	14	19	9	14	7	17
2008	22	14	9	19	12	12	7	7	15	14
2009	14	10	9	9	12	6	9	17	10	10
2010	13	24	7	11	14	9	8	19	15	14
2011	15	27	9	17	8	19	9	14	3	8
2012	8	26	7	11	7	10	12	16	7	8
2013	6	13	13	7	8	17	12	10	11	8
2014	18	12	10	8	7	16	18	7	23	8
2015	8	16	8	8	17	21	17	5	21	13
2016	11	20	4	12	8	7	10	7	6	22
2017	21	27	7	13	13	17	17	9	5	23
2018	19	38	16	19	14	18	24	22	6	18
CV	0.5250	0.5700	0.5816	0.4733	0.3312	0.4885	0.4220	0.4394	0.5768	0.4348

TABLE 4—EXPORT AND IMPORT OUTLIERS IN 2004-2018 BY YEARS AND REPORTING COUNTRIES

Source: Author's calculation.

Lithuania evinced the largest export outliers in EECs at 244 with a high CV. It has increased markedly since 2011. The positive seasonal outliers of exports also hold the largest share in EECs, 27.46% of its total exports. Latvia features in the LSG outliers of exports, 31.91% of its total exports, in which the positives have dominated since the global financial crisis. However, the positive outliers of exports share the lowest compared to the other EECs, 58.72% of its total exports. Estonia maintains a relatively calm relationship with East Asia both in exports and imports. The export outliers present the lowest CV in EECs. The import outliers go along with the highest CVs, but, except the big outliers in 2004-2006, they are quite flat. Slovenia stands for the least outliers both in exports and imports. Nevertheless, the dramatic changes both of export and import outliers are evident, as a result of their high CVs. The positive outliers of imports are located in the highest share compared to the other EECs, 74.19% of its total imports. Romania features negative LSG outliers both of exports and imports. The negative LSGs of imports are much more than the positives, 66.67% of its total import LSGs, the highest share in EECs. The negative LSGs of exports share 44% of its total export LSGs, the second highest after Hungary. Bulgaria's import outliers are seasonal, especially the positive seasonal outliers at 71.43% of its total seasonal outliers, the highest share in EECs. The export outliers have significantly increased since 2010, although the export LSGs have a low share of its total export outliers.

On the meso level of destination countries, the enormous market of China is the most attractive and interesting (see Table 5). The results imply that China exposes the very different outlier patterns between the exports and the imports. The import outliers are the second least in EACs, but the export outliers are the second most. The CV of import outliers is big, but the export is small, so that the difference of both CVs is the largest in EACs (see Table 6). The export LSGs reveal the highest share, 36.13% of its total export outliers compared to the average of 22.57% in the other EACs, and of which 62.79% are positive. On the contrary, the import LSGs display less, of which 55.77% are negative. The results signify that EEC export to China is taking off while the import is shifting up and down. Japan, in spite of having an economy on par with China's, marks a divergent pattern of outliers. The import outliers are the least in EACs, of which 71.85% are positive. However, there are only three to eight import outliers in 2010-2018 compared to 10 to 22 outliers in 2004-2009, suggesting a frozen relationship of imports between Japan and EECs after the global financial crisis. The CV of export outliers is the highest in EACs with the largest share of negative LSGs, 47.06% of its export LSGs. On the other hand, the export outliers have appreciably increased since 2015, suggesting the potential export market for EECs. Both export and import outliers set out significant seasonal patterns. In particular, the TCGs of exports have the largest share in EACs, 43.23% of its total export outliers. Vietnam tends to become an import substitute of China for EECs, most likely due to its strong economic performance and past linkages with EECs (Fforde 2019). The CV of import outliers is the largest, as well as the positive LSGs with 66.67% of its total import LSGs. The export outliers display the least, but with the high CV and the largest share of positive LSGs in EACs, 74.19% of its total export LSGs.

Effects/ Destination Country	AO	AOT12	AOT6	LS	LST12	LST6	T12	T6	Total
Export	1067	92	136	344	68	92	111	183	2093
+	836	79	113	203	32	78	59	103	1503
CN	59	10	7	30	8	16	15	7	152
HK	91	8	14	21	6	12	3	5	160
ID	122	2	13	21		4	5	10	177
JP	71	15	8	13	6	8	5	10	136
KR	82	10	10	26		6	5	12	151
MY	68	8	13	19	2	8	6	10	134
SG	91	10	14	12	8	8	6	10	159
TH	107	12	13	26		4	3	13	178
TW	88	4	6	18	2	6	7	11	142
VN	57		15	17		6	4	15	114
-	231	13	23	141	36	14	52	80	590
CN	36	2	1	32			8	7	86
HK	21			18		4	4	3	50
ID	27		1	10	2		1	10	51
JP	13	1	6	12	8	4	8	4	56
KR	29	4		22		4	6	8	73
MY	16	4	7	13	8		7	5	60
SG	21			9	6	2	3	7	48
TH	30		3	11	6		4	9	63
TW	17		2	8	4		10	13	54
VN	21	2	3	6	2		1	14	49
Import	802	106	102	370	136	102	110	160	1888
+	591	92	78	169	52	74	58	91	1205
CN	42	4	4	13	4	6	9	9	91
HK	78	16	6	13	6	6	4	9	138
ID	50	2	2	20	4	2	5	12	97
JP	51	12	8	8	4	4	2	8	97
KR	42	8	3	20	10	4	8	6	101
MY	67	12	5	21	8	14	7	8	142
SG	87	6	6	17	6	4	1	8	135
TH	68	8	10	17	2	6	5	10	126
TW	45	16	16	20	2	12	11	14	136
VN	61	8	18	20	6	16	6	7	142
-	211	14	24	201	84	28	52	69	683
CN	23	4	2	17	12		1	9	68
HK	21			20	8	2	5	3	59
ID	22	2	4	17	12		3	4	64
JP	4			12	6	2	5	9	38
KR	22	2	9	22	6	4	7	6	78
MY	34		3	24	12	6	5	5	89
SG	7			27	2	4	6	7	53
TH	25			19	14	4	5	9	76
TW	25	4		26	8	6	7	8	84
VN	28	2	6	17	4		8	9	74
Total	1869	198	238	714	204	194	221	343	3981

TABLE 5—EXPORT AND IMPORT OUTLIERS IN 2004-2018 BY DESTINATION COUNTRIES, OUTLIER EFFECTS, AND OUTLIER TYPES

Source: Author's own work.

	CN	HK	ID	JP	KR	MY	SG	TH	TW	VN
Export	238	210	228	192	224	194	207	241	196	163
2004	12	4	13	3	14	11	5	7	12	9
2005	6	7	7	7	8	9	11	11	8	4
2006	10	7	5	13	4	11	10	15	10	12
2007	4	8	10	11	6	19	6	4	11	6
2008	14	10	13	10	14	18	18	7	14	12
2009	9	10	12	6	7	16	9	12	11	7
2010	13	9	15	2	13	23	20	25	15	8
2011	18	11	28	11	16	13	17	23	18	6

	CN	HK	ID	JP	KR	MY	SG	TH	TW	VN
2012	21	19	22	13	19	15	16	23	11	12
2013	17	19	12	16	19	20	19	13	9	11
2014	22	19	8	14	21	5	15	17	7	13
2015	21	27	24	24	19	7	19	18	15	13
2016	22	17	16	25	23	10	12	17	17	26
2017	21	19	21	19	24	8	15	24	18	11
2018	28	24	22	18	17	9	15	25	20	13
CV	0.4307	0.4971	0.4477	0.5358	0.4216	0.4117	0.3445	0.4360	0.3054	0.4716
Import	159	197	161	135	179	231	188	202	220	216
2004	13	11	22	22	4	17	16	9	13	7
2005	5	11	4	12	7	10	17	2	11	2
2006	2	9	4	11	10	16	16	11	25	3
2007	6	20	12	19	18	13	9	11	17	10
2008	17	22	9	12	8	13	12	12	13	13
2009	10	10	10	10	11	11	7	11	10	16
2010	10	9	16	3	17	11	15	16	28	9
2011	10	7	8	6	17	13	14	22	20	12
2012	8	7	13	6	13	13	11	15	11	15
2013	6	24	7	8	7	7	13	15	10	8
2014	9	14	8	6	10	22	7	18	20	13
2015	16	9	13	5	14	23	11	11	16	16
2016	7	9	11	6	11	17	14	13	6	13
2017	12	16	6	5	17	23	11	20	8	34
2018	28	19	18	4	15	22	15	16	12	45
CV	0.5922	0.4316	0.4757	0.6100	0.3645	0.3336	0.2539	0.3615	0.4279	0.7799

TABLE 6—EXPORT AND IMPORT OUTLIERS IN 2004-2018 BY YEARS AND DESTINATION COUNTRIES

Source: Author's calculation

Generally speaking, the export outliers moved up after the global financial crisis. The only exception is the case of Malaysia, where 2014 marks export outliers significantly decreasing but import outliers increasing. The largest export outliers emerge from Thailand, especially since 2010, although the AOGs share a substantial proportion. The import outliers are also large, but the CV is low. The negative LSGs of imports reveal the highest share in EACs, 59.68% of its total import LSGs. Since Hong Kong and Singapore are well known as the twin hubs of international trade, there are many similar outlier behaviors. The first is the approximate number of export outliers, for both positives and negatives. Second, the negative LSGs of imports are larger than the positives, but the exports are the opposite. Third, the CV of export outliers is higher than the imports. The divergence is the significant seasonal outliers, Singapore in exports and Hong Kong in imports. Hong Kong delivers higher CVs of both exports and imports than Singapore. Hong Kong dominates the LSG outliers in exports, 29.05% of its total export outliers, compared to 21.74% for Singapore. But Singapore's LSGs in imports share a bit higher than Hong Kong, respectively 31.91% and 27.92% of its own total import outliers.

Korea, as the primary FDI country in EECs, gets rather stable outliers, especially for imports. The export outliers have increased significantly since 2011. However, the positive outliers of both exports and imports reveal a low rate, 56.42% of its import outliers and 67.41% of its export outliers, compared to the average of 63.9% and 71.81% in EACs, respectively. Taiwan has the lowest CV in the export outliers, though it has been increasing recently. The seasonal outliers of imports represent the highest in EACs, 47.27% of its total imports. Indonesia, with the fourth largest population in the world, expresses the highest share of positive outliers in exports, 77.63% of its total exports, although the AOGs are the greatest. Yet, the import outliers are not active. On the other hand, the import LSGs are higher than the export LSGs, respectively 34.16% of its total imports and 16.23% of its total exports, but in which the negative LSGs of imports are weighty.

On the micro level, the obvious marketing strategy could be evidently seen within the context of outlier inspections. Singapore plays an important role in Poland's exports, the largest outliers without any negatives. The same outlier pattern is found in Hong Kong for Poland's imports. The intra-industry trade case goes to Czechia with Thailand, without any negative export outliers and with an extraordinary number of import outliers. A similar outlier pattern also can be observed in Slovakia's export to Thailand. Hungary's import outliers are dominated by Taiwan and Vietnam, 47.25% of its total imports. In particular, Vietnam creates more in the positive outliers of imports than the negatives. For the exports to Vietnam, the Visegrád countries, except Slovakia, deliver the large positive outliers. However, for exports to China, Slovakia holds the second largest number of outliers, just after Estonia, while the other Visegrád countries hold the least. Estonia shares 41 export outliers for China, 21.69% of its total export outliers, in which AOGs are the most numerous.

IV. Conclusions

This paper makes a contribution to the outlier approach in the context of international trade. It provides evidence that outliers can contain important information for exports and imports with pluralistic thinking. Particularly, outlier types can act as proxies for bilateral trade outlooks. The outlier patterns may subvert the good image of economic events to the adverse effect and vice versa. For example, the celebrated event of EU membership for EECs might pull back the bilateral trade between EECs and EACs, but the seemingly terrible European debt crisis pushes forward EEC exports to EACs.

As the empirical results suggest, EEC exports to EACs are pronounced. Hong Kong and Singapore could be the beachheads from which to access the wider East Asian market. To this end, the EEC policymaker could add fuel to niche marketing in East Asia. With respect to the imports, the solid role of China has been vacillating since the other EACs appear as viable alternatives. In the favourable environment of information technology and transportation, international marketing barriers and transaction costs are being eliminated. EECs could readily search the supply resource along with the changing of comparative advantage among EACs.

This study concludes that Czechia has the most dynamic trade relationship with EACs while Hungary is in a degenerate stage. Poland quickly expanded the EAC market after the EU economic depression. Slovakia has begun take-off trade with EACs, and Slovenia is poised to thrive in the EAC market. As for the Baltic states, Lithuania is experienced in special exports with EACs. Latvia is in the process of trial and error exports to EACs, while Estonia significantly seeks the export market of China. For the 2007 EU member states, Bulgaria is opening up trade with EACs, while Romania is in the face of a trade setback.

Although the EECs are confined to the European market, the trade expansion to East Asia is constantly evolving. The incorporation of EECs into East Asia can lead to significant involvement in global supply chains. Then, this trade trajectory beyond the EU would shed light on the sustainability of economic growth.

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