ISSN 2392-1641
e-ISSN 2450-0097

Economics and Business Review

Volume 6 (20) Number 3 2020

CONTENTS

ARTICLES

Poznań University of Economics and Business Press

Paper based publication

ISSN 2392-1641
e-ISSN 2450-0097

POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS PRESS
ul. Powstańców Wielkopolskich 16, 61-895 Poznań, Poland
phone +48 61 854 31 54, +48 61 854 31 55
www.wydawnictwo.ue.poznan.pl, e-mail: wydawnictwo@ue.poznan.pl
postal address: al. Niepodległości 10, 61-875 Poznań, Poland

Printed and bound in Poland by:
Poznań University of Economics and Business Print Shop

Circulation: 215 copies

sciendo

Economics and Business Review

Volume 6 (20) Number 3 2020

CONTENTS

ARTICLES

Economics and Business Review, Vol. 6 (20), No. 3, 2020: 23-44
DOI: 10.18559/ebr.2020.3.2

Empirical analysis of the relationship between trade wars and sea—air transportation[1]

***Kasım Kiracı*[2], *Ercan Akan*[3]**

Abstract: The aim of this paper is to empirically analyse the relationship between the trade wars and modes of transport for selected countries. For this purpose the causality relationship between trade value and sea transport / air transportation for EU–G20 and US–G20 countries was examined. Panel causality analysis was used as a method in the study. The empirical findings of the study show the existence of a causality relationship between the trade value and modes of transport (sea transport and air transport) for country groups. This shows that the countries' sea and air transport will be adversely affected by trade wars.

Keywords: trade wars, sea transportation, air transportation, panel causality.

JEL codes: L91, C50, F13.

Introduction

Trade wars have been one of the most discussed issues both in the academic community and in politics recently. Trade wars manifest themselves largely as the use of additional customs duties and anti-dumping duties (Conybeare, 1987). If there is no agreement between countries in trade wars there is an increase in the costs of certain import products as a result of additional customs duties and trade barriers. Trade wars are also a form of overprotective economic conflict in which countries create tariffs or other trade barriers against each other. According to Conybeare (1987) there is a close relationship between the size of being affected by trade wars and the economic size of the country.

[1] Article received 19 October 2019, accepted 27 July 2020.

[2] Iskenderun Technical University, Faculty of Aeronautics and Astronautics, Department of Aviation Management, Central Campus, 31200, Iskenderun, Hatay, Turkey, corresponding author: kasim.kiraci@iste.edu.tr, ORCID: https://orcid.org/0000-0002-2061-171X.

[3] Iskenderun Technical University, Barbaros Hayrettin Faculty of Naval Architecture and Maritime, Maritime Transportation Management Engineering, Central Campus, 31200, Iskenderun, Hatay, Turkey, ercan.akan@iste.edu.tr, ORCID: http://orcid.org/0000-0003-0383-8290.

Accordingly large countries are largely unaffected by their own trade restrictions or restrictions with another country. However trade restrictions adversely affect small countries. One of the main reasons for this negative effect is the trade value asymmetry between the small and large countries. Therefore it is possible to mention the existence of a relationship between economic magnitudes and the level of influence in economic trade wars.

Trade wars have recently become one of the most frequently used methods to give countries a commercial advantage or punish another country. Therefore it is important to examine the negative effects of trade wars between countries. The negative impact of trade wars between countries is not limited to the trade value of countries. It is thought that trade wars may affect the goods or services related to the trade value and the sectors connected to it. The sectors covered in this study are sea transportation and air transportation. In this study it is assumed that trade wars between countries will affect the trade value of the country and therefore the sea and air transportation sectors used in the realization of trade activities will be affected.

This study examines the causality relationship between trade value and sea transport / air transportation for EU–G20 and US–G20 countries. This study is expected to contribute to the literature in several aspects. The first is that no studies have examined the relationship between trade wars and modes of transport in the literature. Thus it was aimed to fill this gap in the literature. Secondly, the impact of the trade wars on sea transport and air transport is to be examined in the context of the G20 countries. In this context it is aimed at determining the effect of trade wars[4] on G20 countries. The last is to examine the relationship between two modes of transport (sea transport and air transport) and commercial activities. This will enable the assessment of the impact of the trade wars on transport modes for the G20 countries.

The remainder of the paper is organized as follows. The first section presents the literature on the relationship between economy, trade and transportation. The second section contains detailed information about the variables and data used in the study. The third section describes the statistics of the sample and reports the main empirical results using firm-level data. The last section concludes the paper.

[4] We use data on trade values that do not directly test the relationship between trade wars and mode of transport. Rather the search was for Granger causality between the value of trade and the mode of transport. However, depending on trade wars, there may be a contraction in trade value between countries. Therefore the authors analyzed the possible indirect effects of a trade war here on the mode of transport.

1. Literature

In this study which examines the effects of trade wars between countries on maritime and air transport the literature will be discussed under the heading on the relationships between air and sea transportation and economic developments. In the literature there are many studies investigating the causality relationship between the transportation sector and economic growth (Gramlich, 1994). It is seen that the focus of these studies is the cause-effect relationship between economic growth and transportation sector. Tong and Yu (2018) analysed the cointegration and causal relationship between growth of economic and transportation in China for 2000–2015. The results found a granger causal relationship between transportation and the growth of economic.

There are also studies in the literature that examine the relationship between commercial activities and the transportation sector among countries. In this context Nguyen and Tongzon (2010) concluded that Australia's trade volume with China, Japan and the USA contributed to the development of Australia's transport sector for the period 2001–2004. Saidi and Hammami (2017) concluded that there is a two-way causality relationship between freight transport and economic growth in the 2000–2014 period for high, middle- and low--income countries. This finding is consistent with the results obtained by Pao, Yu and Yang (2011). In other studies in the literature the transportation and economic relationship in the United States (Alagic, 2017); the relationship between transportation and GDP for EU28 countries (Gardiner & Hajek, 2016) and the dynamic relationship between freight transport, energy consumption and GDP in the United States (Benali & Feki, 2018) were empirically examined. Donaldson (2018) analysed railroads for general equilibrium in the trade model and the findings are a decrease of trade costs, an increase of trade and GDP. Hummels's (2007) technological changes in sea transportation was the critical input to growing trade in the first era of globalization during the latter half of the nineteenth century. The technological change in air transportation and the declining cost of rapid transportation has been a critical input into a second era of globalization.

In the literature there are studies which examine the effect of transportation modes on the economy of the country. In this context Taghvaee, Omaraee and Taghvaee (2017) discussed the short- and long-term impact between sea transport and GDP. Park and Seo (2016) examined the impact of ports on regional economic growth. Konstantakis, Papageorgiou, Christopoulos, Dokas and Michaelides (2019) studied transport fluctuations in Greece for the period 1998–2015 by analysing granger causality so, the findings were that the maritime sector were not affected by local economy. Rashid Khan and others (2018) analysed panel econometric techniques accounting for cross-sectional dependence and heterogeneity for 24 upper middle and high-income countries in the period of 1990–2015. Container traffic at the port positively affected per capita income across countries. Martínez-Zarzoso and Nowak-Lehmann (2007) analysed the real distance is not a good proxy for transportation costs and identify the central variables influencing road and sea transportation costs. Road and sea transport costs are central explanatory factors of exports and they seem to deter trade to a greater extent than road or maritime transit time when endogeneity is considered.

On average, changes in transportation costs account for almost half of the changes in welfare. These findings suggest that the endogeneity of transportation costs is an important mechanism determining the welfare effects of such a policy change. Research suggests that trade costs decline when total bilateral trade, which includes all modes of transportation, increases (Asturias, 2020). Wessel (2019) analysed five different transportation infrastructure types with respect trade effects. The results are shown there is a relationship between air and rail trade in the corresponding infrastructure type. Transport infrastructure plays an evident role in the export performance of economic growth for a country.

There are many studies focusing on the economic impact of air transport in the literature. The impact of economic development in the US on air transport (Chi & Baek, 2013); the relationship between air transport and GDP for countries in the South Asia region (Hakim & Merkert, 2016); the long-term and short-term causality relationship between economic growth and domestic passenger traffic in China (Hu, Xiao, Deng, Xiao, & Wang, 2015); the cointegration and causality relationship between air transport demand and economic growth in Brazil (Marazzo, Scherre, & Fernandes, 2010); the symmetric and asymmetric causality between GDP and the demand for airline in Turkey (Kiraci, 2018); the relationship between air transport and macroeconomic variables in Turkey (Kiraci & Battal, 2018); the causality relationship between air transport demand and economic growth in Italy (Brida, Bukstein, & Zapata-Aguirre, 2016) and the long-run relationship between aviation demand and economic growth in India (Mehmood, Shahid, & Younas, 2013) were examined.

In other studies in the literature the impact of air cargo transportation on local economic development in the United States (Button & Yuan, 2013); the impact of air traffic on regional economic performance in Europe (Mukkala & Tervo, 2013); the impact of civil aviation activities on international trade in Europe (Brugnoli, Dal Bianco, Martini, & Scotti, 2018); the relationship between airline passenger traffic and economic growth for seven different geographical regions of the world (Profillidis & Botzoris, 2015); the short and long-term impact of regional air transport on regional economic growth in Australia (Baker, Merkert, & Kamruzzaman, 2015) were investigated. Costa, Caetano, Alves and Rossi (2019) studied relationship between air transport services and economic development by using the linear regression method. The results show ambiguous relationships between explicative and dependent variables. Accordingly it can be seen that empirical studies are rarely seen in which the effects of trade wars on transport modes (sea transport and air transport) as discussed in this study. Therefore this study is expected to fill this gap in the literature.

2. Data and method

In this study basically three different variables were used. The first is trade value data. In this context international trade in goods ($) data from both EU and USA to G20 countries were utilised. The second data used in the study is on sea transport. The data obtained here refers to the portion of the trade value from the EU and the US to the G20 countries, carried by sea. In other words the data related to the part of the total trade value made from the EU and the USA to the G20 countries using sea transportation was used. The last data used in the study is related to how much of the trade in the aforementioned countries takes place by air transportation. In other words data on the part of the total trade value from the EU and the US to the G20 countries using air transport was obtained. G20 countries realize approximately 75% of the international trade in the world. Therefore the countries that carry out trade wars and direct foreign trade were analysed. In addition countries that can be considered as related to trade wars are included.

In the study the total trade value from EU to G20 countries and transportation modes[5] (sea and air transportation) used in the trade between 2002 and 2016 were used. Since the data cannot be obtained for all countries the trade value, sea and air transport data from EU to fifteen countries were analysed in the mentioned period. Similarly data on the total trade value from the USA to the G20 countries in the period of 1999–2016 and the modes of transport (sea and air transport) used were used. In this study trade value, maritime and air transport data from the USA to sixteen countries were included in the analysis due to the lack of data. The data used in the study were obtained from the International Trade Administration (ITA) and Eurostat database.

Two different analyses were used to reveal the causality relationship between trade value and trade modes of transportation (maritime and air transport). The first of these is the bootstrap panel Granger causality analysis (based on the assumption of heterogeneity) developed by Kónya (2006). The second is

[5] Most of the countries analyzed are separated by large bodies of water. Therefore sea and air transport are (in most cases) the only two options for trade between countries. However other modes of transportation (such as land or rail) are also used in commercial activities between countries. The authors considered based on the value of trade only with sea and air transport. This is one of the limitations of the study.

the panel causality test used for heterogeneous mixed models developed by Emirmahmutoglu and Kose (2011). The reason for choosing these panel causality tests is that they are widely used in the literature. In addition these are the panel causality methods most suitable for the data of the study. These methods reveal the causal relationship between variables. Therefore it is appropriate to use panel causality methods in the study, Kónya (2006) and Emirmahmutoglu and Kose (2011).

3. Empirical findings

In this study international trade in goods by mode of transport were analyzed. The main purpose of the study is to reveal the effect of the spread of trade wars on the modes of transportation in countries. Descriptive statistics of the variables included are presented in Table 1.

Table 1. Descriptive statistics

	Variables	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Obs.
EU	TRADE	1.11E+11	6.21E+11	8.56E+09	1.33E+11	2.002457	6.059461	225
	SEA	5.71E+10	3.18E+11	6.69E+09	6.62E+10	2.273894	7.457055	225
	AIR	2.98E+10	2.76E+11	7.67E+08	5.09E+10	2.908334	10.91958	225
USA	TRADE	155129.7	699721.5	4772.800	189160.2	1.426049	3.717200	288
	SEA	1.27E+09	1.31E+10	9000000	2.12E+09	2.993213	14.26909	288
	AIR	8.01E+08	7.20E+09	2000000	1.31E+09	3.139224	13.42217	288

Source: Own study based on The International Trade Administration (ITA) and Eurostat database.

3.1. Cross-sectional dependency

Panel causality analyses were performed and firstly whether there is a cross-sectional dependency in the series (Table 2) was examined. The cross-sectional dependence relates to whether the shock occurring in any of the series is affected by all units (countries) included in the panel data. Breusch and Pagan (1980), Pesaran (2004) and Pesaran, Ullah and Yamagata (2008) cross-sectional dependence tests were used.

Table 2 shows the cross-sectional dependence test results. It shows that the $\mathbf{H_0}$ hypothesis was rejected in both country groups included in the analysis. This shows that there is a horizontal cross-section dependence in the series. Given the developments in globalization and free movement of capital, trade relations between countries are expected to be versatile and affect each other.

Table 2. Cross-sectional dependency test results

Country Groups	Test	Trade	Sea	Air
EU	CDlm (Breusch,Pagan, 1980)	*1053.2	*1196.2	*1079.6
	CDlm (Pesaran, 2004)	*64.396	*74.262	*66.218
	LMadj (PUY, 2008)	*63.860	*73.727	*65.682
USA	CDlm (Breusch,Pagan, 1980)	*1659.9	*730.42	*1349.6
	CDlm (Pesaran, 2004)	*98.368	*38.370	*78.342
	LMadj (PUY, 2008)	*97.897	*37.899	*77.872

Note: * the null hypothesis ($\mathbf{H}_0$) is rejected at a significance level of 1%.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

Therefore the results of horizontal cross-sectional dependence are in line with the expectations.

3.2. Kónya (2006) panel causality test

The panel causality test developed by Kónya (2006) uses the seemingly unrelated regressions estimator instead of least squares. In the bootstrap panel causality analysis proposed by Kónya (2006) bootstrap test statistics are used instead of asymptotic critical test statistics in the Wald test. In this way cross-sectional dependence and heterogeneity are taken into consideration. In addition pre-tests such as stationarity and cointegration are not required for the series. In this method the direction of causality is analysed based on country-specific bootstrap critical values in the Wald test and does not require a common hypothesis for all members of the panel (Altıntas & Mercan, 2015, p. 328).

Kónya's panel causality approach describes a system that includes two sets of equations. The bootstrap based panel causality method can be expressed by the following equation series.

$$\begin{aligned} y_{1t} &= \alpha_{1,1} + \sum_{i=1}^{ly_1} \beta_{1,1,i} y_{1,\,t-i} + \sum_{i=1}^{lx_1} \delta_{1,1,i} x_{k,1,\,t-i} + \varepsilon_{1,1,t} \\ y_{2t} &= \alpha_{1,2} + \sum_{i=1}^{ly_1} \beta_{1,2,i} y_{2,\,t-i} + \sum_{i=1}^{lx_1} \delta_{1,2,i} x_{k,2,\,t-i} + \varepsilon_{1,2,t} \\ y_{N,t} &= \alpha_{1,N} + \sum_{i=1}^{ly_1} \beta_{1,N,i} y_{N,\,t-i} + \sum_{i=1}^{lx_1} \delta_{1,N,i} x_{k,N,\,t-i} + \varepsilon_{1,N,t} \end{aligned} \quad (1)$$

and

$$
\begin{aligned}
x_{k,1,t} &= \alpha_{2,1} + \sum_{i=1}^{ly_2} \beta_{2,2,i} y_{2,t-i} + \sum_{i=1}^{lx_2} \delta_{2,2,i} x_{k,2,t-i} + \varepsilon_{2,1,t} \\
x_{k,2,t} &= \alpha_{2,2} + \sum_{i=1}^{ly_2} \beta_{2,2,i} y_{2,t-i} + \sum_{i=1}^{lx_2} \delta_{2,2,i} x_{k,2,t-i} + \varepsilon_{2,2,t} \\
x_{k,N,t} &= \alpha_{2,N} + \sum_{i=1}^{ly_2} \beta_{2,N,i} y_{N,t-i} + \sum_{i=1}^{lx_2} \delta_{2,N,i} x_{k,N,t-i} + \varepsilon_{2,N,t}
\end{aligned} \qquad (2)
$$

In this equation y represents trade (TRADE) between countries and x represents sea or air transport (SEA-AIR). In addition N represents the number of units (countries) in the *panel* (j = 1, …, N), t represents the time period (t = 1, …, T), and l indicates the number of delays. ly_1 and lx_1 represent the maximum delay lengths of the variables in the first set of equations, and ly_2 and lx_2 represent the maximum delay lengths of the variables in the second equation system. As a result of the application for a unit in the panel (i), if the all coefficients $\delta_{1,i}$ are not equal to zero and the all coefficients $\beta_{2,i}$ β are equal to zero, therefore there is a one-way causality relationship from x to y. Similarly, if all of the coefficients $\beta_{2,i}$ β are not equal to zero and all of the coefficients $\delta_{1,i}$ δ are equal to zero, there is a one-way causality relationship from y to x. In addition if the coefficients $\delta_{1,i}$ and $\beta_{2,i}$ δ are not all equal to zero, then there is a bi-directional causality relationship between the variables. Finally, if the coefficients $\delta_{1,i}$ and $\beta_{2,i}$ are equal to zero it is concluded that there is no causality between the variables. The bootstrap panel causality test results obtained from the analysis are presented in Table 3.

Table 3 presents the results of the causality analysis of trade and sea transport from the European Union (EU) countries to the G20 countries. According to the analysis there is a causality relationship from trade to sea transport from EU to Brazil, Canada, Turkey and the United States. This situation indicates that trade value between EU and mentioned countries will be affected by sea transport depending on the growth opportunities. In contrast none of the countries included in the analysis have a causality relationship from sea transport to trade value.

Table 4 presents the results of the causality analysis for trade value and air transport from the European Union (EU) countries to the G20 countries. Accordingly, none of the countries included in the analysis have a causality relationship from trade value to air transport or from air transport to trade value.

Table 5 presents the results of the causality analysis of trade value and sea transport from the US to the G20 countries. None of the countries included in the analysis have a causality relationship.

Table 6 presents the results of the causality analysis of trade value and sea transport from the United States to the G20 countries. None of the countries included in the analysis have a causality relationship.

Table 3. Kónya (2006) causality test results (EU)

Country	Trade → Sea				Sea → Trade			
	w_i	Bootstrap Critical Values			w_i	Bootstrap Critical Results		
		1%	5%	10%		1%	5%	10%
EU–Argentina	–1243.5	7682.801	1149.111	493.701	104.715	7685.54	957.892	495.819
EU–Australia	–1223.4	6003.066	1031.821	482.815	30.501	7989.88	1123.803	509.047
EU–Brazil	***858.284	8140.149	1029.556	480.488	95.266	7543.60	1083.279	454.324
EU–Canada	**152304.4	4678.542	868.855	454.736	42.942	8146.12	1055.441	418.446
EU–China	–1294.5	4455.123	1047.420	433.452	100.029	6317.46	1318.894	497.638
EU–India	–2555.1	8151.930	1125.447	509.122	104.455	7306.67	1112.393	474.687
EU–Indonesia	–1570.8	5458.282	1096.938	492.848	97.577	6732.28	1038.601	475.359
EU–Japan	1.046	5115.060	1134.109	491.765	93.203	7096.57	1135.490	444.831
EU–South Korea	–1806.1	5965.956	1069.627	492.772	104.734	8428.63	1107.719	496.580
EU–Mexico	–1671.4	7313.985	913.989	442.858	105.102	6146.37	1096.581	505.595
EU–Russia	–1233.3	6886.838	1042.331	437.972	104.864	9885.64	1136.408	491.287
EU–Saudi Arabia	–1373.6	7464.293	865.305	431.639	66.100	10830.8	1194.108	512.136
EU–South Africa	–1233.8	6509.008	943.499	470.734	101.321	11729.0	1028.658	450.025
EU–Turkey	**10603.2	8690.694	1053.298	450.304	99.682	8248.11	1187.738	536.957
EU–USA	**648.672	8630.201	1057.405	492.312	104.880	8280.57	1064.294	479.666

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

Table 4. Kónya (2006) causality test results (EU)

Country	Trade → Sea				Sea → Trade			
	w_i	Bootstrap Critical Values			w_i	Bootstrap Critical Results		
		1%	5%	10%		1%	5%	10%
EU–Argentina	97.572	6725.473	811.651	368.514	142.718	8913.766	1161.61	433.035
EU–Australia	96.856	8247.346	824.074	394.796	142.005	7400.964	1048.91	420.516
EU–Brazil	29.607	5746.493	822.809	368.913	136.597	6017.789	1016.82	465.204
EU–Canada	58.757	7037.566	907.855	380.964	136.332	8112.597	845.047	407.101
EU–China	97.602	3586.912	810.554	353.718	139.416	7604.436	1046.88	440.359
EU–India	96.683	8191.474	861.082	358.493	89.295	8344.347	1130.58	443.124
EU–Indonesia	97.364	10122.25	919.409	368.757	90.685	9779.866	874.293	419.876
EU–Japan	80.840	6405.011	878.440	388.366	142.18	6169.240	1059.93	395.925
EU–South Korea	97.067	8201.006	893.963	364.559	77.265	8934.245	1100.44	445.888
EU–Mexico	5.319	4950.817	892.222	398.480	52.913	8658.067	953.245	406.011
EU–Russia	97.639	4773.795	838.381	380.311	143.19	6828.189	1195.56	407.365
EU–Saudi Arabia	97.561	7329.639	817.462	359.895	29.928	6487.957	1104.99	418.12
EU–South Africa	96.913	4127.004	850.430	399.466	94.468	8668.535	963.774	447.453
EU–Turkey	21.788	5771.955	727.058	365.560	134.81	11692.85	950.069	439.214
EU–USA	96.424	3711.060	827.657	370.366	140.89	7592.858	1074.52	399.842

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

Table 5. Kónya (2006) causality test results (USA)

Country	Trade → Sea				Sea → Trade			
	w_i	Bootstrap Critical Values			w_i	Bootstrap Critical Results		
		1%	5%	10%		1%	5%	10%
USA–Argentina	154.809	4180.582	655.753	315.773	148.294	5674.143	806.125	366.519
USA–Australia	153.058	4573.424	608.735	297.166	148.591	6061.587	1080.54	395.989
USA–Brazil	123.027	3274.832	623.093	315.848	56.6240	2565.416	587.087	310.436
USA–Canada	155.651	3615.214	594.885	296.222	141.847	4462.326	710.395	339.547
USA–China	156.624	5513.859	594.878	291.140	148.518	5108.308	697.768	393.486
USA–EU 28	156.569	3566.172	694.602	327.533	149.362	6590.945	774.416	355.236
USA–France	144.961	2357.301	578.396	298.524	145.011	4986.924	653.101	337.635
USA–Germany	154.544	2832.508	598.021	317.302	98.8570	4762.063	712.367	361.866
USA–India	156.630	3946.738	596.990	293.590	147.299	4339.696	770.421	367.517
USA–Indonesia	156.601	2776.938	564.315	293.944	145.758	7815.235	863.432	393.309
USA–Italy	156.290	3386.610	598.711	293.808	145.450	6237.577	644.197	380.345
USA–Japan	153.784	4566.218	668.116	325.563	146.089	4728.487	728.170	357.905
USA–South Korea	127.977	4191.720	602.965	322.324	130.846	8975.128	719.346	359.333
USA–Mexico	153.811	3808.306	601.774	295.143	127.986	12399.71	771.478	394.465
USA–Saudi Arabia	156.039	4430.841	650.195	307.548	147.663	7224.482	766.897	391.292
USA–South Africa	156.047	4455.146	695.119	323.514	147.034	6490.193	739.038	345.527

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

Table 6. Kónya (2006) causality test results (USA)

Country	Trade → Sea				Sea → Trade			
	w_i	Bootstrap Critical Values			w_i	Bootstrap Critical Results		
		1%	5%	10%		1%	5%	10%
USA–Argentina	138.432	8886.461	1512.52	506.710	91.367	9034.259	969.7980	416.660
USA–Australia	156.425	10585.37	1553.54	565.250	11.399	4485.848	1020.081	431.790
USA–Brazil	154.570	9285.171	1477.36	507.757	95.760	6665.648	1174.754	468.864
USA–Canada	156.284	8139.975	1468.21	528.457	89.199	6878.176	1143.724	488.854
USA–China	132.172	11626.45	1515.32	516.685	96.963	5346.774	1010.610	455.392
USA–EU 28	156.409	9530.565	1438.22	492.983	4.7210	4868.539	1103.018	442.281
USA–France	156.308	6971.612	1467.74	509.962	107.28	4840.799	1208.663	465.659
USA–Germany	156.525	9374.152	1353.17	490.778	103.66	6002.496	983.1470	420.035
USA–India	156.101	10333.23	1391.66	506.791	107.46	8880.285	1103.609	494.557
USA–Indonesia	152.349	12508.58	1457.62	543.703	99.998	7031.281	1085.524	486.377
USA–Italy	156.147	11780.41	1596.89	517.801	104.40	6799.399	1009.827	438.602
USA–Japan	156.249	7672.560	1305.62	480.038	90.481	6893.892	1028.014	459.725
USA–South Korea	155.343	6871.794	1356.59	518.416	99.273	10821.47	1102.217	472.832
USA–Mexico	154.733	9737.657	1557.94	537.691	3.7090	5352.750	1234.246	467.657
USA–Saudi Arabia	155.402	6331.009	1204.83	495.695	97.078	6064.425	1071.180	458.670
USA–South Africa	155.356	6503.913	1066.18	453.380	100.50	4723.813	1142.105	468.811

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

3.3. Emirmahmutoglu and Kose (2011) panel causality test

The panel causality test developed by Emirmahmutoglu and Kose (2011) is a method based on meta-analysis in mixed heterogeneous panels. In the meta--analysis developed by Fisher (1932), tests are performed for N units and the significance levels (probability values) of this test statistic are used. The superior side of this test, which is the panel data version of the causality test developed by Toda and Yamamota (1995), is that it reduces information loss by modelling the series with level values, allows the delay length to be differentiated for each series and take into account the horizontal cross-section dependence (Zeren & Ergün, 2013, p. 233; Buberkoku, 2016, p. 189).

In the panel causality test developed by Emirmahmutoglu and Kose (2011) a standard panel VAR estimate is made at the first stage and the appropriate delay length (p) is determined. In the next step, the integration level (d_{max}) of the variable with the highest degree of integration is added to the appropriate delay length. Finally a panel VAR model is estimated using the level values of the variables for the delay level ($p + d_{max}$) (Emirmahmutoglu & Kose, 2011, pp. 871–872; Topallı, 2016, p. 89). In Emirmahmutoglu and Kose (2011) test, panel VAR model is estimated for each horizontal section as follows.

$$x_{it} = \mu_i^x + \sum_{j=1}^{k_i + d\max_i} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{12,ij} y_{i,t-j} - u_{i,t}^x \quad (3)$$

$$y_{it} = \mu_i^x + \sum_{j=1}^{k_i + d\max_i} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{22,ij} y_{i,t-j} - u_{i,t}^x \quad (4)$$

In the analysis the test is performed with the corrected Wald (modified Wald) test for the estimated k_i lag length. The hypothesis $\mathbf{H_0}$ is established as there is no causality relationship from the variable y to the variable x.

Table 7 presents the results of the causality analysis of trade value and sea transport from the European Union (EU) countries to the G20 countries. There is a causality relationship from trade value to sea transport from EU to Australia, Indonesia and Mexico. In addition there is a causality relationship between sea transport to trade value from the EU to Australia, Indonesia, South Korea, Mexico and Russia. In this context there is a two-way causality relationship from trade value to sea transport from EU to Australia, Indonesia and Mexico. The results of Fisher's test statistics, which generally evaluate the findings for all countries in the table, show that there is a two-way causality relationship from trade value to sea transport and from sea transport to trade value.

Table 8 presents the results of the causality analysis of trade value and air transport from the European Union (EU) countries to the G20 countries. There

Table 7. Emirmahmutoglu and Kose (2011) causality test results (EU)

Country	Trade → Sea			Sea → Trade		
	k_i	w_i	prob.	k_i	w_i	prob.
EU–Argentina	1	0.482	0.4870	1	0.330	0.5660
EU–Australia	3	*76.11	0.0000	3	*180.1	0.0000
EU–Brazil	1	1.086	0.2970	1	1.587	0.2080
EU–Canada	3	3.047	0.3840	3	3.440	0.3290
EU–China	1	0.547	0.4600	1	0.451	0.5020
EU–India	1	0.053	0.8180	1	0.046	0.8310
EU–Indonesia	3	*13.12	0.0040	3	**8.488	0.0370
EU–Japan	1	0.225	0.6350	1	0.734	0.3920
EU–South Korea	3	3.833	0.2800	3	**9.490	0.0230
EU–Mexico	2	**5.659	0.0590	2	***4.824	0.0900
EU–Russia	1	1.758	0.1850	1	1.621	0.2030
EU–Saudi Arabia	1	0.034	0.8530	1	0.132	0.7160
EU–South Africa	1	0.713	0.3990	1	0.334	0.5640
EU–Turkey	1	0.006	0.9390	1	0.020	0.8870
EU–USA	1	0.270	0.6030	1	0.184	0.6680
Panel Fisher		*106.58	0.0000		*210.38	0.0000

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively, k_i shows the optimal lag length. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

is a causality relationship from trade value to air transport from EU to Japan and USA. In addition, there is a causality relationship from the EU and the US air transport to trade value. In this respect there is a two-way causality relationship from trade value from EU to USA to air transportation and from air transportation to trade value.

Table 9 presents the results of the causality analysis of trade value and sea transport from the US to the G20 countries. There is a causal relationship from trade value sea transportation from USA to Brazil. In addition, there is a causal relationship from sea transportation to trade value from the USA to France, Italy and South Korea. The Fisher test statistics, in which the findings are gen-

Table 8. Emirmahmutoglu and Kose (2011) causality test results (EU)

Country	Trade → Sea			Sea → Trade		
	k_i	w_i	prob.	k_i	w_i	prob.
EU–Argentina	3	1.165	0.7610	3	0.723	0.8680
EU–Australia	1	0.128	0.7200	1	1.395	0.2380
EU–Brazil	3	0.562	0.9050	3	0.180	0.9810
EU–Canada	1	0.141	0.7070	1	1.563	0.2110
EU–China	1	0.397	0.5290	1	0.400	0.5270
EU–India	2	1.975	0.3730	2	0.296	0.8620
EU–Indonesia	1	0.064	0.8000	1	0.028	0.8660
EU–Japan	1	**6.273	0.0120	1	0.000	0.9930
EU–South Korea	1	0.388	0.5330	1	0.185	0.6670
EU–Mexico	2	1.648	0.4390	2	***4.618	0.0990
EU–Russia	1	0.107	0.7440	1	0.073	0.7870
EU–Saudi Arabia	1	0.806	0.3690	1	0.000	0.9940
EU–South Africa	1	0.017	0.8980	1	0.037	0.8470
EU–Turkey	1	1.258	0.2620	1	1.212	0.2710
EU–USA	3	**8.070	0.0450	3	**10.636	0.0140
Panel Fisher		29.195	0.5070		25.604	0.6950

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively, k_i shows the optimal lag length. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

erally evaluated for all countries in the table, show that there is a two-way causality relationship from sea transport to trade value.

Table 10 presents the results of the causality analysis of trade value and air transport from the US to the G20 countries. There is a causal relationship from trade value to air transportation from USA to France, Italy and Saudi Arabia. In addition there is a causality relationship from the US to France, Germany, Italy and South Africa between air transport to trade value. In this context there is a bi-directional causality relationship between air transport and trade value from the USA to France and Italy. The Fisher test statistics, in which the findings are generally evaluated for all countries in the table, show that there is

Table 9. Emirmahmutoglu and Kose (2011) causality test results (USA)

Country	Trade → Sea			Sea → Trade		
	k_i	w_i	prob.	k_i	w_i	prob.
USA–Argentina	1	2.097	0.1480	1	0.112	0.7380
USA–Australia	2	1.501	0.4720	2	1.261	0.5320
USA–Brazil	3	*14.29	0.0030	3	2.489	0.4770
USA–Canada	2	0.945	0.6230	2	0.589	0.7450
USA–China	1	0.293	0.5880	1	0.124	0.7240
USA–EU 28	1	0.120	0.7290	1	0.906	0.3410
USA–France	2	1.362	0.5060	2	**6.841	0.0330
USA–Germany	1	1.527	0.2170	1	1.599	0.2060
USA–India	1	0.659	0.4170	1	2.543	0.1110
USA–Indonesia	1	0.121	0.7280	1	0.265	0.6070
USA–Italy	2	4.323	0.1150	2	*15.63	0.0000
USA–Japan	3	0.767	0.8570	3	4.105	0.2500
USA–South Korea	3	5.714	0.1260	3	*17.21	0.0010
USA–Mexico	1	0.643	0.4230	1	1.182	0.2770
USA–Saudi Arabia	1	0.930	0.3350	1	0.430	0.5120
USA–South Africa	1	0.010	0.9200	1	1.509	0.2190
Panel Fisher		39.573	0.1680		*62.186	0.001

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively, k_i shows the optimal lag length. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

a two-way causality relationship between trade value to air transport and from air transport to trade value.

Conclusions

In this study the causal relationship between trade value and transportation modes (sea transportation or air transportation) is examined empirically. In the study, trade value data for 15 countries from the EU and 16 countries from

Table 10. Emirmahmutoglu and Kose (2011) causality test results (USA)

Country	Trade → Sea			Sea → Trade		
	k_i	w_i	prob.	k_i	w_i	prob.
USA–Argentina	3	0.722	0.8680	3	0.881	0.8300
USA–Australia	1	0.413	0.5200	1	1.868	0.1720
USA–Brazil	3	1.118	0.7730	3	3.020	0.3890
USA–Canada	1	2.141	0.1430	1	0.220	0.6390
USA–China	2	1.271	0.5300	2	3.153	0.2070
USA–EU 28	1	0.581	0.4460	1	0.846	0.3580
USA–France	3	*13.55	0.0040	3	*12.12	0.0070
USA–Germany	1	1.555	0.2120	1	**3.143	0.0760
USA–India	1	1.277	0.2590	1	1.013	0.3140
USA–Indonesia	1	0.117	0.7320	1	0.005	0.9450
USA–Italy	3	***6.698	0.0820	3	*19.24	0.0000
USA–Japan	1	1.442	0.2300	1	0.229	0.6330
USA–South Korea	2	1.151	0.5620	2	0.124	0.9400
USA–Mexico	2	2.809	0.2450	2	1.612	0.4470
USA–Saudi Arabia	2	**8.754	0.0130	2	3.262	0.1960
USA–South Africa	3	2.184	0.5350	3	*33.53	0.0000
Panel Fisher		*82.36	0.0000		**48.47	0.0310

Note: TRADE → SEA: It means that trade is the cause of sea transport. SEA → TRADE: It means that sea transport is the cause of trade. The values of *, ** and *** indicate that the test statistic is significant at 1%, 5% and 10% significance levels, respectively, k_i shows the optimal lag length. The optimal lag length was determined according to the Akaike information criterion. Bootstrap number is 1000. The maximum lag length is 3.

Source: Own study based on the International Trade Administration (ITA) and Eurostat database.

the USA and data on the modes of transport used to provide this trade value are included in the analysis. Within the scope of the study, panel Granger causality developed by Kónya (2006) and panel causality analyses developed by Emirmahmutoglu and Kose (2011) were used to reveal the causality relationship between these variables.

According to Kónya (2006) the panel Granger causality results showed that there is a causality relationship from trade value to sea transport from EU to Brazil, Canada, Turkey and the United States. This situation shows that a positive or negative situation in the trade value in these countries will affect the sea transport. Emirmahmutoglu and Kose (2011) panel causality findings indicate that there is a Granger causality relationship from trade value to sea transport from EU to Australia, Indonesia and Mexico. In addition there is a Granger causality relationship from sea transport to trade value from the EU to Australia, Indonesia, South Korea, Mexico and Russia. The findings also show that there is a bi-directional Granger causality relationship between the trade value relationship from trade value to sea transport from EU to Australia, Indonesia and Mexico. The results of the Fisher test statistics, which evaluated the causality findings for all countries in the study, show that there is a two-way Granger causality relationship between trade value to sea transport and between sea transport to trade value. The results show that developments that may affect the volume of trade from the EU to the countries mentioned may affect sea transport. Furthermore, developments in sea transport are expected to affect trade value between countries.

The results of the causality analysis for air transport from the EU to the G20 countries show that there is a Granger causality relationship from the trade value to air transport from the EU to Japan and the US. Moreover, there is a Granger causality relationship air transport to trade value the EU and US. In this context developments that may affect the trade value from the EU to Japan and the USA are expected to affect air transportation.

According to the results of the analysis of trade value and sea transport from the US to the G20 countries there is a Granger causality relationship from trade value to sea transport from the US to Brazil. Therefore the findings indicate that developments that may affect trade value between the USA and Brazil may also affect sea transport. Furthermore, there is a Granger causality relationship between sea transport to trade value from the US to France, Italy and South Korea. The results show that a positive or negative situation in sea transport from the USA to France, Italy and South Korea may affect trade value. The results of Fisher's test statistics, which generally evaluated the findings for all countries included in the analysis, indicate the presence of a two-way causality relationship between sea transport to trade value.

According to the results of the analysis of trade value and air transport from the US to the G20 countries, there is a Granger causality relationship between trade value to air transport between the US to France, Italy and Saudi Arabia. Hence, developments that may affect the trade value between these countries and the USA are expected to affect air transportation. Besides, the findings suggest that there is a Granger causality relationship between air transport to trade value from the US to France, Germany, Italy and S.Africa. The Fisher test statistics, which generally evaluated the findings for all countries included in the analysis, show that there is a bi-directional Granger causality relationship between trade value to air transport and between air transport to trade value.

Different findings were found after the Kónya (2006) and Emirmahmutoglu and Köse (2011) panel causality analysis. This is because the econometric models behind these tests are different. There is no information in the literature about which test is superior but the aim here is to reveal the causal relationship through different panel causality tests. In addition it is seen that the causal results of sea and air transport are different. In other words while there is a causal relationship between trade value and sea transport in one country, there is no causal relationship with air transport in the same country. The main reason for this is that the products carried by sea and air transport have different characteristics. For example, heavy but relatively inexpensive products are carried by sea. In air transport light and expensive products are carried. Therefore the causal relationship may differ depending on the mode of transport. In international trade the weight and price of the products transported is the reason why the causal relationship differs.

When the findings obtained within the scope of the study are evaluated in general terms it is expected that trade wars, currency wars and the protective policies of the countries will affect the trade value. It has been empirically demonstrated that trade contraction between countries may also affect sea and air transport. Due to the close relationship between trade value and transport modes developments that may occur between countries and affect trade value are also expected to affect transport modes. Therefore the stakeholders of the sea and air transport sectors should take into account the trade value between the countries and the expected developments in the trade value. In future studies low income countries can feature and the effect of international trade in goods on transportation modes can be analysed. In addition examining the long-term relationship in studies may contribute to the literature.

References

Alagic, A. (2017). An analysis of the causal relationship between transportation and GDP: A time-series approach for the United States. *Major Themes in Economics*, *19*(1), 17-37.

Altıntaş, H., & Mercan, M. (2015). The relationship between research and development (R&D) expenditures: Panel cointegration analysis under cross sectional dependency on OECD countries. *Journal of Ankara University*, *70*(2), 345-376. Retrieved from https://doi.org/10.1501/SBFder_0000002355

Asturias, J. (2020). Endogenous transportation costs. *European Economic Review*, *123*, 103-366. Retrieved from https://doi.org/10.1016/j.euroecorev.2019.103366

Baker, D., Merkert, R., & Kamruzzaman, M. (2015). Regional aviation and economic growth: Cointegration and causality analysis in Australia. *Journal of Transport Geography*, *43*, 140-150. Retrieved from https://doi.org/10.1016/j.jtrangeo.2015.02.001

Benali, N., & Feki, R. (2018). Evaluation of the relationship between freight transport, energy consumption, economic growth and greenhouse gas emissions: The VECM approach. *Environment, Development and Sustainability*, *22*(2), 1039-1049. Retrieved from https://doi.org/10.1007/s10668-018-0232-x

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239--253. doi:10.2307/2297111

Brida, J. G., Bukstein, D., & Zapata-Aguirre, S. (2016). Dynamic relationship between air transport and economic growth in Italy: A time series analysis. *International Journal of Aviation Management*, *3*(1), 52-67.

Brugnoli, A., Dal Bianco, A., Martini, G., & Scotti, D. (2018). The impact of air transportation on trade flows: A natural experiment on causality applied to Italy. *Transportation Research Part A: Policy and Practice*, *112*, 95-107. Retrieved from https://doi.org/10.1016/j.tra.2018.01.010

Buberkoku, O., & Sahmaroglu, S. T. (2016). Examining the role of trading volume on beta coefficients: Evidence from Turkish banks. *The Journal of Business Science*, *4*(1), 1-28. Retrieved from https://doi.org/10.22139/ibd.73036

Button, K., & Yuan, J. (2013). Airfreight transport and economic development: An examination of causality. *Urban Studies*, *50*(2), 329-340. Retrieved from https://doi.org/10.1177%2F0042098012446999

Chi, J., & Baek, J. (2013). Dynamic relationship between air transport demand and economic growth in the United States: A new look. *Transport Policy*, *29*, 257-260. Retrieved from https://doi.org/10.1016/j.tranpol.2013.03.005

Conybeare, J. (1987). *Trade wars: The theory and practice of international commercial rivalry*. New York: Columbia University Press.

Costa, F. A., Caetano, M., Alves, C. J. P., & Rossi, R. (2019). Measuring the influence of the commodity market performance over the supply and demand of regional air travel. *Journal of Aerospace Technology and Management*, *11*, 1-12. Retrieved from https://doi.org/10.5028/jatm.v11.1014

Donaldson, D. (2018). Railroads of the Raj: Estimating the impact of transportation infrastructure. *American Economic Review*, *108*(4-5), 899-934. Retrieved from https://doi.org/10.1257/aer.20101199

Emirmahmutoglu, F., & Kose, N. (2011). Testing for Granger causality in heterogeneous mixed panels. *Economic Modelling*, *28*(3), 870-876. Retrieved from https://doi.org/10.1016/j.econmod.2010.10.018

Eurostat database, EU trade since 2000 by mode of transport. Retrieved from https://ec.europa.eu/eurostat/data/database

Fisher, R. A. (1932). *Statistical methods for research workers* (4th ed.). Edinburgh: Oliver and Boyd.

Gardiner, R. & Hajek, P. (2016). *The causal relationship among sustainable development indicators and economic growth: The case of AB28 countries*. (16th International Scientific Conference Globalization and Its Socio-Economic Consequences, University of Zilina, The Faculty of Operation and Economics of Transport and Communication, Department of Economics, 5–6 October).

Gramlich, E. M. (1994). Infrastructure investment: A review essay. *Journal of Economic Literature*, *32*(3), 1176-1196.

Hakim, M. M., & Merkert, R. (2016). The causal relationship between air transport and economic growth: Empirical evidence from South Asia. *Journal of*

Transport Geography, *56*, 120-127. Retrieved from https://doi.org/10.1016/j.jtrangeo.2016.09.006

Hu, Y., Xiao, J., Deng, Y., Xiao, Y., & Wang, S. (2015). Domestic air passenger traffic and economic growth in China: Evidence from heterogeneous panel models. *Journal of Air Transport Management*, *42*, 95-100.

Hummels, D. (2007). Transportation costs and international trade in the second era of globalization. *Journal of Economic Perspectives*, *21*(3), 131-154. doi:10.1257/jep.21.3.131

International Trade Administration (ITA) database. Retrieved from https://www.trade.gov/trade-data-analysis.

Kiracı, K. (2018). Causality analysis between airline industry and economic growth: An empirical application on Turkey. *Dokuz Eylul University Faculty of Economics and Administrative Sciences Journal*, *1*(33), 97-216.

Kiracı, K., & Battal, Ü. (2018). Macroeconomic determinants of air transportation: A VAR analysis on Turkey. *Gaziantep University Journal of Social Sciences*, *17*(4), 1536-1557.

Konstantakis, K. N., Papageorgiou, T., Christopoulos, A. G., Dokas, I. G., & Michaelides, P. G. (2019). Business cycles in Greek sea transport: An econometric exploration (1998-2015). *Operational Research*, *19*(4), 1059-1079. Retrieved from https://doi.org/10.1007/s12351-017-0331-8

Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, *23*(6), 978-992. Retrieved from https://doi.org/10.1016/j.econmod.2006.04.008

Marazzo, M., Scherre, R., & Fernandes, E. (2010). Air transport demand and economic growth in Brazil: A time series analysis. *Transportation Research Part E: Logistics and Transportation Review*, *46*(2), 261-269. Retrieved from https://doi.org/10.1016/j.tre.2009.08.008

Martinez-Zarzoso, I., & Nowak-Lehmann, F. D. (2007). Is distance a good proxy for transport costs? The case of competing transport modes. *The Journal of International Trade & Economic Development*, *16*(3), 411-434. doi:10.1080/09638190701527186

Mehmood, B., Shahid, A., & Younas, Z. I. (2013). Interdepencies between aviation demand and economic growth in India: Cointegration equation estimation. *Economic Affairs*, *58*(4), 337-347. doi:10.5958/j.0976-4666.58.4.017

Mukkala, K., & Tervo, H. (2013). Air transportation and regional growth: Which way does the causality run?. *Environment and Planning A*, *45*(6), 1508-1520. Retrieved from https://doi.org/10.1068%2Fa45298

Nguyen, H. O., & Tongzon, J. (2010). Causal nexus between the transport and logistics sector and trade: The case of Australia. *Transport Policy*, *17*(3), 135-146. Retrieved from https://doi.org/10.1016/j.tranpol.2009.12.005

Pao, H., Yu, H. & Yang, Y. (2011). Modelling the CO_2 emissions, energy use, and economic growth in Russia. *Energy*, *36*(8), 5094-5100. Retrieved from https://doi.org/10.1016/j.energy.2011.06.004

Park, J. S., & Seo, Y. J. (2016). The impact of seaports on the regional economies in South Korea: Panel evidence from the augmented Solow model. *Transportation Research Part E: Logistics and Transportation Review*, *85*, 107-119. Retrieved from https://doi.org/10.1016/j.tre.2015.11.009

Pesaran, M. H. (2004, August). General diagnostic tests for cross section dependence in panels. (CESifo Working Paper Series No. 1229; IZA Discussion Paper No. 1240).

Pesaran, M. H., Ullah, A., & Yamagata, T. (2008). A bias-adjusted LM test of error cross-section independence. *The Econometrics Journal*, *11*(1), 105-127. Retrieved from https://doi.org/10.1111/j.1368-423X.2007.00227.x

Profillidis, V., & Botzoris, G. (2015). Air passenger transport and economic activity. *Journal of Air Transport Management*, *49*, 23-27. Retrieved from https://doi.org/10.1016/j.jairtraman.2015.07.002

Rashid Khan, H. U. R., Siddique, M., Zaman, K., Yousaf, S. U., Shoukry, A. M., Gani, S., … & Saleem, H. (2018). The impact of air transportation, railways transportation, and port container traffic on energy demand, customs duty, and economic growth: Evidence from a panel of low-, middle-, and high-income countries. *Journal of Air Transport Management*, *70*, 18-35. Retrieved from https://doi.org/10.1016/j.jairtraman.2018.04.013

Saidi, S., & Hammami, S. (2017). Modeling the causal linkages between transport, economic growth and environmental degradation for 75 countries. *Transportation Research Part D: Transport and Environment*, *53*, 415-427. Retrieved from https://doi.org/10.1016/j.trd.2017.04.031

Taghvaee, S. M., Omaraee, B., & Taghvaee, V. M. (2017). Maritime transportation, environmental pollution, and economic growth in Iran: Using dynamic log linear model and Granger causality approach. *Iranian Economic Review*, *21*(2), 185-210. Retrieved from https://dx.doi.org/10.22059/ier.2017.62100

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, *66*(1-2), 225-250. Retrieved from https://doi.org/10.1016/0304-4076(94)01616-8

Tong, T., & Yu, T. E. (2018). Transportation and economic growth in China: A heterogeneous panel cointegration and causality analysis. *Journal of Transport Geography*, *73*, 120-130. Retrieved from https://doi.org/10.1016/j.jtrangeo.2018.10.016

Topallı, N. (2016). The relationship between foreign direct investment, trade openness and economic growth: The case of Turkey and BRICS countries. *Dogus University Journal*, *17*(1), 83-95.

Wessel, J. (2019). Evaluating the transport-mode-specific trade effects of different transport infrastructure types. *Transport Policy*, *78*, 42-57. Retrieved from https://doi.org/10.1016/j.tranpol.2019.04.002

Zeren, F., & Ergün, S. (2013). Trade openness and government size relationship: Panel causality test. *Atatürk Faculty of Economics and Administrative Sciences Journal*, *27*(4), 229-240.

Aims and Scope

The **Economics and Business Review** is a quarterly journal focusing on theoretical, empirical and applied research in the fields of Economics and Corporate and Public Finance. The Journal welcomes the submission of high quality articles dealing with micro, mezzo and macro issues well founded in modern theories and relevant to an international audience. The EBR's goal is to provide a platform for academicians all over the world to share, discuss and integrate state-of-the-art Economics and Finance thinking with special focus on new market economies.

The manuscript

1. Articles submitted for publication in the **Economics and Business Review** should contain original, unpublished work not submitted for publication elsewhere.
2. Manuscripts intended for publication should be written in English, edited in Word in accordance with the **APA editorial** guidelines and sent to: secretary@ebr.edu.pl**.** Authors should upload two versions of their manuscript. One should be a complete text, while in the second all document information identifying the author(s) should be removed from papers to allow them to be sent to anonymous referees.
3. Manuscripts are to be typewritten in **12' font in A4 paper** format, one and half spaced and be aligned. Pages should be numbered. Maximum size of the paper should be up to 20 pages.
4. Papers should have an abstract of about 100-150 words, keywords and the Journal of Economic Literature classification code (**JEL Codes**).
5. Authors should clearly declare the aim(s) of the paper. Papers should be divided into numbered (in Arabic numerals) sections.
6. **Acknowledgements** and references to grants, affiliations, postal and e-mail addresses, etc. should appear as a separate footnote to the author's name a, b, etc and should not be included in the main list of footnotes.
7. **Footnotes** should be listed consecutively throughout the text in Arabic numerals. Cross-references should refer to particular section numbers: e.g.: See Section 1.4.
8. **Quoted texts** of more than 40 words should be separated from the main body by a four-spaced indentation of the margin as a block.
9. **References** The EBR 2017 editorial style is based on the **6th editio**n of the Publication Manual of the American Psychological Association (**APA**). For more information see APA Style used in EBR guidelines.
10. **Copyrights** will be established in the name of the **E&BR publisher**, namely the Poznań University of Economics and Business Press.

More information and advice on the suitability and formats of manuscripts can be obtained from:

Economics and Business Review
al. Niepodległości 10
61-875 Poznań
Poland
e-mail: secretary@ebr.edu.pl
www.ebr.edu.pl

Subscription

Economics and Business Review (E&BR) is published quarterly and is the successor to the Poznań University of Economics Review. The E&BR is published by the Poznań University of Economics and Business Press.

Economics and Business Review is indexed and distributed in Claritave Analytics, DOAJ, ERIH plus, ProQuest, EBSCO, CEJSH, BazEcon, Index Copernicus and De Gruyter Open (Sciendo).

Subscription rates for the print version of the E&BR: institutions: 1 year – €50.00; individuals: 1 year – €25.00. Single copies: institutions – €15.00; individuals – €10.00. The E&BR on-line edition is free of charge.