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GLOBAL TRADE: TESTING PERSISTENCE IN GLOBAL SHIPPING BASED ON THE LINER SHIPPING CONNECTIVITY INDEX (LSCI)

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Abstract
This study investigates persistence in the liner shipping connectivity index for 16 countries, namely, the G7, BRICS, and MINT countries from 2006Q1 to 2021Q1. Both the autoregressive and fractional integration methods are used for the analysis of break-adjusted and non-break-adjusted series. Findings from the study show that the liner shipping connectivity index (LSCI) for more countries in the G7 economic group has lower persistence than for countries in the other economic groups – MINT and BRICS – whether the series is adjusted for a structural break or not, thus pointing to a possible quick recovery from a shock than elsewhere. This shows that any disruption to global trade, as proxied by LSCI, will be suffered more by developing countries than developed ones.

JEL Classification: N7, F14
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1. Introduction

The global economy depends on shipping to keep its wheels turning. This reality was demonstrated in the days following the blockage of the Suez Canal in Egypt by the Ever Given vessel in March 2021, creating fears of a possible threat to global supply and demand, given that the Canal is a major route for ships moving the highest number of containers in the world (Rusinov *et al.*, 2021). The connection that countries have to the global shipping network is an indication of the extent to which global trade takes place (Li *et al.*, 2015), contributes to economic growth (Michail *et al.*, 2021), and indicates the level of economic integration such countries have with the rest of the world. Thus, events related to global shipping have the potential to shape world economy (Simcock and Kamara, 2016), given that 80% of trade across the world is carried by ships (UNCTAD, 2021).

Shipping connectivity is an important determinant of bilateral trade (Hoffmann *et al.*, 2020; Saeed *et al.*, 2021). The extent of shipping connectivity reduces trade costs, thus enhancing trade flows. Shipper change demand based on changes to shipping connectivity (Hoffmann *et al.*, 2020) and this puts pressure on supply chains and has the potential to make economies more autarkic, reducing trade and global connectivity. Furthermore, shipping connectivity is important because it enhances intra-regional trade, which occurs as a result of removing trade barriers by countries in a particular region, and extra-trade, which is the result of rising regional integration enhanced by shipping connectivity (Lun & Hoffmann, 2016).

One of the ways to gauge global shipping is through liner shipping, which is "generally characterized by vessels that operate along pre-specified, fixed routes according to a regular, fixed schedule, where the majority of these vessels are now container ships" (van Dellen, 2011, p. 20). Liner shipping is important for determining the geography of trade and the transportation of most finished and semi-finished goods (Bertho *et al.*, 2014; Fugazza and Hoffmann, 2017). The liner shipping connectivity index (LSCI) by the United Nations Conference on Trade and Development (UNCTAD, 2021) is an index that "allows the assessment of maritime connectivity for container shipping, enabling comparisons between countries and over time" (UNCTAD, 2019). It is a window into the extent to which countries are connected to the rest of the world through trade. Thus, it is important to understand the level of persistence in the LSCI as a way of understanding the effect of shocks on global trade. To put it differently, the statistical feature of persistence in the LSCI allows us to make conclusions about the enduring nature of a trade shock; this, in turn, reflects the stability, or otherwise, in global trade. The choice of LSCI, as described in section 3 of this study, is made because it represents a more comprehensive measure of the movement of container ships across the world. The Baltic Exchange Dry Index is another index that tracks ship movement across the world. Although the COVID-19 pandemic is responsible for a decline of about 0.03% and 0.046% in both the

Baltic Dry Index and Baltic Dirty Tanker, respectively (Michail and Melas, 2020), thus reflecting the adjustments container liners made to their capacity to respond to falling demand (Notteboom *et al.*, 2021), the Baltic index represents only the cost of shipping raw materials, such as coal, iron ore and fertilizers (UNCTAD, 2021), rather than finished goods as the LSCI does. Persistence in LSCI will help explain how global trade will behave following shocks to shipping connectivity. If the LSCI of a country or country-group shows persistence (inadvertently, persistence in shipping), positive/negative shocks will have long lasting effect on trade (see Heiland *et al.*, (2021)); otherwise such shocks will easily fizzle out.

Given how important shipping connectivity is to determine export (Şeker, 2020), it is important to establish the statistical features of the LSCI to ascertain how well the index responds to shocks, which further indicates the extent to which international trade will be affected, especially regarding the degree the merchandise trade of countries is proportionate to their connection, as shown through LSCI (Lin *et al.*, 2020). There are few studies into the persistence of LSCI apart from the study by Sun *et al.*, (2021), which found that ship flow from Shanghai and Singapore ports has long-range dependence, thus taking time to recover from a shock, studies in this area are sparse.

Here is how this study contributes to relevant literature: to our knowledge, this is the first paper to investigate the persistence of the LSCI. Studying the persistent properties of the LSCI using the fractional integration approach is superior to standard methods, such as the ARIMA models, because it is more general and considers integer orders of the integration (Gil-Alana and Monge, 2020). The study also adds the autoregressive method of estimating persistence to enhance robustness.

Findings from the analysis show that the more advanced economies (the G7) have lower persistence in LSCI than the less developed economies of MINT and BRICS. Thus, the G7 economies will most likely recover from an external shock to bilateral trade more easily than countries in the MINT and BRICS groups.

The rest of the paper is structured as follows: In section 2, we lay out the methodology adopted in the study. Section 3 describes data and source; section 4 discusses empirical results, while section 5 concludes the study.

2. Methodology

In this section, the methodology underpinning this study is laid out. As stated earlier, this adopts the non-integer-valued order of analysing persistence. The traditional method does not allow for fractional differencing, that is, integrated series are restricted to 0, 1, and 2. Economic series have been shown not to necessarily follow integer integration, that is, $I(1)$ process but can be fractionally integrated (Gil-Alana and Carcel, 2020)Baillie and Bollerslev (1994. Fractionally integrated series are such that the impact of shocks is not assumed to be permanent but transient, even if the transitory nature of such shocks takes time to fizzle out (Oloko *et al.*, 2021; Salisu *et al.*, 2020). As far as we know, this approach has not been applied for understanding the time series properties of the LSCI. Hence, we extend the fractional integration approach to understanding the LSCI by estimating the following equation:

$$(1-L)^d \, lsci_t = \alpha + \gamma Trend + \varepsilon_t \tag{1}$$

Where $lsci_t$ is the log of the Liner Shipping Connectivity Index; d is any real value; L is the lag operator so that $Llsci_t = lsci_{t-1}$; $(1 - L)^d$ is a polynomial function of order d; a is the model intercept; γ is the trend coefficient that allows the model to be expressed in a more generalized form for the determination of the fractional order; $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. The polynomial function in equation (1) can be reformulated using the binomial expansion so that, for all real d,

$$(1-L)^d = \sum_{j=0}^{\infty} \psi_j L^j = \sum_{j=0}^{\infty} \binom{d}{j} (-1)^j L^j = 1 - dL + \frac{d(d-1)}{2} L^2 - \ldots, \tag{2}$$

$$(1-L)^d lsci_t = lsci_t - d \, lsci_{t-1} + \frac{d(d-1)}{2} lsci_{t-2} - \ldots, \tag{3}$$

Thus, equation (1) becomes:

$$lsci_t = \alpha + \gamma Trend + d \, lsci_{t-1} - \frac{d(d-1)}{2} lsci_{t-2} - \ldots + \varepsilon_t \tag{4}$$

In equation (4), d is the degree of dependence of *lsci* so that, the higher the value of d, the higher the level of association of the series between observations (Gil-Alana and Carcel, 2020). The value of the fractional integration parameter d can be one of these three cases: first, if $d = 0$, then current $lsci_t$ is not dependent on its past values, in which case the series is described as covariance stationary; second, if d lies between 0 and 0.5, $lsci_t$, it is said to possess "long memory" but it is mean, reverting and stationary; third, if $d \geq 0.5$, $lsci_t$, it is said to be non-stationary but mean reverting.

If possesses "long memory", it can be mean reverting or non-mean reverting. If $lsci_t$ possesses "long memory", it can be mean reverting or non-mean reverting. It is mean reverting if 0.5<d<1, while it is non-mean reverting if d≥1, in which case, shocks to $lsci_t$ will tend to remain permanent.

Asides from the fractional integration estimation, the autoregressive approach will be employed to estimate the fractional integration parameter for robustness.

We account for unknown structural breaks in each series using the Perron (1997) method. The Perron (1997) method looks for a single unknown break point. Once the break point is found, it is common for researchers to account for it in the model by including a dummy of the break period as a regressor in the linear model.

However, given that this study is a univariate analysis, we adopt the innovative three-step method of Salisu and Obiora (2021) in accounting for the break period which is found using the Perron (1997) method. In the first step, we use the ADF method to determine the break dates in the LSCI for each country. Next, we construct a dummy variable for each of the break periods and regress each of the variables against the dummy. We illustrate step two in equation (5)

$$y_t = \vartheta + \sum_{j=1}^{N} \iota_j D_{jt} + \mu_t \quad (5)$$

In equation (5), y is the break-adjusted series; D_j is 1 for each j, and zero otherwise. Finally, the break-adjusted series is determined by estimating $y_t^d = y_t - \sum_{j=1}^{N} \hat{\iota}_j D_{jt}$. Persistence is thus tested on the break-adjusted series.

3. Data and source

The Liner Shipping Connectivity Index (LSCI) for 16 countries from 2006Q1 to 2021Q1 is sourced from the United Nations Conference on Trade and Development (UNCTAD)[1]. These countries are divided into various economic groups, which are: the Group of seven (G7) countries comprising Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States; the MINT economies comprising Mexico, Indonesia, Nigeria, and Turkey; the BRICS economies comprising Brazil, Russia, India, China, and South Africa. According to UNCTAD (2019)[2], LSCI is based on five container shipping components – (i) the number of shipping lines servicing a country, (ii) the size of the largest vessel servicing the country, (iii) the number of services to which a country is interconnected, (iv) the number of container ships deployed in a country, and (v) the carrying capacity of these containers. Thus, this is a comprehensive measure of container ship movement across the world. The higher a country's index, the more its maritime activities are connected to the rest of the world.

In Figure 1, it is observed that in all the countries under review, the LSCI follows an upward linear pattern. In the G7 countries, Figure 1 shows that Canada is the lowest, while there is intense competition at the topmost, with the United States, the United Kingdom, and France. In the BRICS economies, it is observed that China is far ahead of the other countries in the index. In the MINT group, intense competition among Mexico, Indonesia, and Turkey ended around 2009, with Turkey in a clear lead. The lowest ranking country in the trend is Nigeria.

1. Data accessed via https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=92
2. Accessed via https://unctad.org/news/unctad-maritime-connectivity-indicators-review-critique-and-proposal

Table 1 confirms what is observed in Figure 1. Among the G7 countries, it is seen that within the period under review, Canada had the lowest index at 32.12, while the United States the highest at 105.56. Among the MINT countries, Nigeria had the lowest index at 15.71, with Turkey having the highest index at 61.53. Finally, among the BRICS economies, Russia had the lowest index at 18.50, while China the highest at 163.81. On average, of the 16 countries sampled for the study, Nigeria had the lowest index at 20.91 while China the highest at 133.91. It can be concluded that China was the most connected maritime country, while Nigeria the least connected, of the countries sampled within the study period.

Table 1. Descriptive statistics

	Mean	Max.	Min.	S. Dev.	Skew.	Kurt	J-B	Obs.
G7								
Canada	39.44	47.53	32.12	4.90	0.22	1.58	5.63**	61
France	66.55	79.29	56.83	6.93	0.08	1.60	5.08**	61
Germany	81.84	85.53	76.07	2.39	-0.43	2.05	4.19***	61
Italy	63.36	77.14	54.19	5.22	0.62	3.45	4.42***	61
Japan	73.94	88.70	65.37	5.27	1.06	4.19	15.08	61
United Kingdom	82.24	91.21	74.11	4.80	0.17	1.71	4.53***	61
United States	84.32	105.56	74.23	7.64	0.93	3.61	9.73	61
MINT								
Mexico	39.46	49.07	30.75	5.86	0.06	1.70	4.31***	61
Indonesia	36.88	51.13	32.68	4.28	1.57	4.29	29.34	61
Nigeria	20.91	29.16	15.71	2.25	0.07	5.39	14.59	61
Turkey	47.34	61.53	29.79	9.77	-0.39	1.66	6.11	61
BRICS								
Brazil	34.37	37.55	30.18	1.70	-0.53	2.50	3.53***	61
Russia	35.79	53.09	18.50	10.15	-0.24	1.66	5.13**	61
India	48.68	58.48	38.41	5.54	0.25	1.82	4.13***	61
China	133.91	163.81	100.00	16.27	-0.12	2.28	1.48***	61
South Africa	35.73	41.92	26.78	4.11	-0.54	2.23	4.42***	61

Source: Computed by author

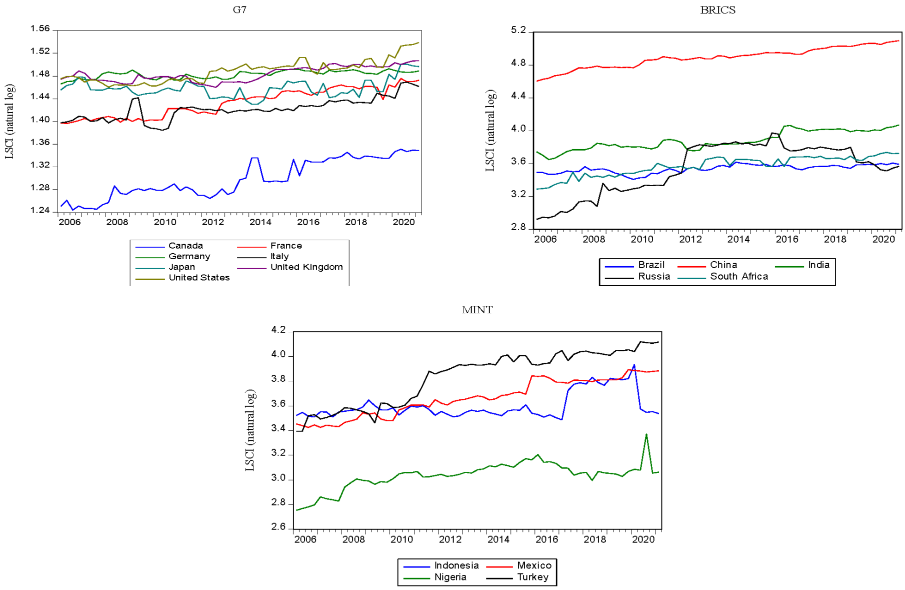

Figure 1. Trends in the Liner Shipping Index in the G7, BRICS and MINT

4. Empirical results

In this section, the result of the analysis is presented and discussed. It is worth remembering that, if the estimated d = 0 for *lsci*, the series has short memory and is covariant stationary; for d≥0.5, the series has long memory and is mean reverting and stationary, while for , the series has long memory, it is non-stationary, but mean reverting. For a series that exhibits long memory and is non-stationary, if 0.5<*d*<1, the impact of shocks will not be permanent, but if d≥1, the impact of shocks will be permanent. The empirical result of the study is subdivided into two groups: the first one presents the persistence of the LSCI without structural breaks, and the second one presents and discusses the result with structural breaks.

4.1 Persistence in the liner shipping connectivity index without structural breaks

In Table 2, the result of the persistence test on liner shipping connectivity index is presented without structural breaks. The result for all country-groups shows that both the autoregressive and fractional integration methods of estimating *d* present evidence of fractional differencing in the series, even if *d* is at different levels of significance. When examining *d*, it is observed that in the G7 countries, Germany, Italy, Japan, and the United Kingdom, the LSCI possesses short memory, and is covariance stationary given that falls within the interval *d*(0,0.5). Hence, for these countries, shocks to the LSCI will have only a temporary effect and recovery will be quick. For Canada, France, and the United Kingdom, it is futile modelling the LSCI with fractional differencing without controlling for structural breaks.

In MINT economies, it is observed that parameter *d* in all countries is not statistically significant; therefore, it may not be appropriate to explain the behaviour of the LSCI in the MINT economic group using the fractional differencing approach in the absence of structural breaks.

BRICS economies are found to behave similarly to MINT economies. In other words, parameter *d* for all countries is not statistically significant, except for Russia, for which it is significant at the 10% level. Again, similar to the MINT countries case, adopting the fractional differencing approach for understanding the behaviour of the LSCI in the absence of structural breaks is not an optimal approach.

Table 2. Persistence in the Liner Shipping Connectivity Index using the autoregressive and fractional integration approaches without structural break

	Autoregressive approach		Fractional Integration approach		
LSCI	$\sum_{i=1}^{p}\gamma_i(p)$	$\sum_{i=1}^{p}\gamma_i=1$	d [se]	$d=0.5$	$d=1$
G7 Countries					
Canada	0.5415***(2)	-0.4585***	-0.0255[0.1927]	-2.7266***	-5.3210***
France	0.5466***(1)	-0.4534***	0.1274[0.3038]	-1.2263	-2.8719**
Germany	0.6115***(2)	-0.3885***	0.5000***[2.11E-06]	-2.6806***	-2.369069***
Italy	0.4893***(2)	-0.5107***	-0.3963**[0.1900]	-4.7184***	-7.3504***
Japan	0.7255***(1)	-0.2745***	-0.2756[0.2233]	-3.4740**	-5.7135***
United Kingdom	0.8692***(1)	-0.1308*	-0.1319[0.1858	-3.4009***	-6.0921***
United States	0.7124***(1)	-0.2876***	0.4857[0.3855]	-0.0372	-1.3341
MINT					
Mexico	0.6062***(1)	-0.3938***	0.0671[0.2222]	-1.9494	-4.2012***
Indonesia	0.7683***(1)	-0.2317**	-0.2726[0.2009]	-3.8454***	-6.3339***
Nigeria	0.7280***(3)	-0.2720**	0.1854[0.5355]	-0.5874	-1.5211
Turkey	0.8908***(3)	-0.1092	0.4329[0.9900]	-0.0678	-0.5729
BRICS					
Brazil	0.7623***(1)	-0.2377***	-0.2308[0.1960]	-3.7287***	-6.2799***
Russia	0.9587***(1)	-0.0413	0.4812*[0.2724]	-0.0689	-1.9047*
India	0.7087***(3)	-0.2913***	-0.0998[0.2148]	-2.7930***	-5.1213***
China	0.6240***(5)	-0.3760***	0.1596[0.1365]	-2.4934**	-6.1559***
South Africa	0.6618***(2)	-0.3382***	0.3741[0.3137]	-0.4014	-1.9955**

Note: ***, ** and * represent level of significance at 1%, 5% and 10%, respectively. Figures in "[ ]" are standard errors (se), while figures in "( )" are the optimal lag length for the autoregressive model. The lag length for the autoregressive model is selected using the Akaike Information Criterion (AIC); according to the result, the maximum lag length is 5. The traditional autoregressive model is defined as $lsci_t = \propto + \beta t + \sum_{i=1}^{p}\gamma_i \, lsci_{t-1} + \varepsilon_t$, where $lsci_t$ is the liner shipping connectivity index, t is the trend term, p is the optimal lag length, $\sum_{i=1}^{p}\gamma_i$ is the sum of the autoregressive coefficients measuring the degree of persistence. The maximum likelihood method is used to estimate the d fractional parameter using the parametric method in line with Sowell (1992). The restriction test for shocks to the liner shipping connectivity index lasting forever are $\sum_{i=1}^{p}\gamma_i = 1$ and $d = 1$. The test that $d = 0.5$ tests that the liner shipping connectivity index is fractionally integrated. The Wald test is conducted for the restriction test, while the t statistics is reported with respect to testing restrictions for d.

Source: Computed by author.

Table 3. Persistence in the Liner Shipping Connectivity Index using the autoregressive and fractional integration approaches with structural break

	Autoregressive approach		Fractional Integration approach				Break Dates
LSCI	$\sum_{i=1}^{p}\gamma_i(p)$	$\sum_{i=1}^{p}\gamma_i=1$	d [se]	$d=0.5$	$d=1$		
G7 Countries							
Canada	0.5322***(3)	-0.4678***	-0.4228***[0.1033]	-8.9327***	-13.7730***		2014Q1
France	0.9045***(1)	-0.0955	-0.079[0.1709]	-3.3887***	-6.3148***		2019Q2
Germany	0.4770***(2)	-0.5230***	-0.6388***[0.1739]	-6.5472***	-9.4219***		2013Q3
Italy	0.6664***(2)	-0.3336***	0.4991***[0.0111]	-0.0765	-45.3192***		2009Q3
Japan	0.3421**(1)	-0.6579***	0.3476***[0.1201]	-1.2691	-5.4323***		2019Q4
United Kingdom	0.8935***(1)	-0.1065*	-0.1181[0.2123]	-2.9115***	-5.2670***		2009Q2
United States	0.4486***(1)	-0.5514***	0.4669**[0.1765]	-0.1878	-3.0215***		2020Q2
MINT							
Mexico	0.8392***(2)	-0.1608*	-0.0481[0.3911]	-1.4015	-2.6799***		2015Q4
Indonesia	0.5350***(1)	-0.4650***	-0.4674**[0.1990]	-4.8612***	-7.3738***		2017Q2
Nigeria	0.6899***(3)	-0.3101**	0.1148[0.5140]	-0.7494	-1.7221*		2020Q3
Turkey	0.5552***(1)	-0.4448***	0.4881***[0.1156]	-0.1028	-4.4274***		2011Q3
BRICS							
Brazil	0.7731***(1)	-0.2269***	-0.2204[0.2205]	-3.2679***	-5.5359***		2008Q1
Russia	0.8281***(2)	-0.1719*	0.3739[0.3920]	-0.3217	-1.5973		2012Q2
India	0.8223***(2)	-1.1777**	0.4987***[0.0143]	-0.0940	-35.0721***		2012Q2
China	0.8691***(1)	-0.1309*	0.4882***[0.1157]	-0.1016	-4.4220***		2010Q3
South Africa	0.7666***(1)	-0.1992***	-0.0285[0.2073]	-2.5494**	-4.9613***		2014Q1

Note on structural beaks: Structural break dates are determined based on Perron (1997) and then filtered from the liner shipping connectivity index series of each country.

Source: Computed by author.

4.2Persistence in the liner shipping connectivity index with structural break

In Table 3, the result of the persistence test on the liner shipping connectivity index (LSCI) with structural breaks is presented. Again, adopting the autoregressive method and fractional method, results for all country-groups show evidence of fractional differencing in the series. From the analysis, it is observed that the LSCI in the G7 economies performed better after controlling for structural breaks. From the result, given that parameter d for France is not significant, we can conclude that modelling persistence in the LSCI for France using fractional differencing is not optimal. Apart from France, parameter d for the rest of the countries is statistically significant. For Canada, Italy, Japan, the United Kingdom, and the United States, the LSCI possesses short memory, and it is covariance stationary, given that *d* falls within the interval *d*(0,0.5). This implies that shocks to the LSCI of these countries will fizzle out within a short period. For Germany, it is observed that parameter *d* falls within the interval (0.5<*d*<1). This implies that for Germany, the LSCI possesses long memory, and it is highly persistent, but mean reverting. The implication is that shocks to the LSCI for Germany will take a longer time to die out.

In MINT economies, it is observed that there is a marked improvement in the persistence of the LSCI for the economies. Going by the value of parameter *d*, we find that the LSCI for Indonesia and Turkey lies within the interval *d*(0,0.5). The implication of this is that shocks to the LSCI in these two countries, after controlling for structural breaks, possesses short memory and is covariance stationary, making it possible for these two countries to easily recover from a shock to the LSCI. For Mexico and Nigeria, it is still not appropriate to model the LSCI using fractional differencing, given that their *d* parameters are not statistically significant.

Persistence in the LSCI for BRICS economies, after controlling for structural breaks, follows that of MINT economies. For India and China, the value of parameter *d* lies within the interval *d*(0,0.5) and it is statistically significant. This shows that the LSCI for these two countries has short memory and is covariance stationary, implying that the index will easily recover from unexpected shocks.

5. Implication and Conclusion

In this study, the persistence of the liner shipping connectivity index is examined using both the autoregressive and fractional integration methods. The analysis is done for the G7, BRICS and MINT economies from 2006Q1 to 2021Q1. The analysis is carried out for break-adjusted and non-break-adjusted series.

Empirical results show that for most of the countries considered, adopting the fractional integration approach for understanding the series is appropriate, as shown by the results from the autoregressive method. In the non-break adjusted series, *d* parameter for most countries is not significant. In addition, fewer countries exhibit short memory. After controlling for a structural break, it is found that the LSCI for most countries in the G7 group exhibit short memory and low persistence (except for France), while two countries each, in the MINT and BRICS economies, show short memory and low persistence in the LSCI. These countries are Indonesia and Turkey for the MINT group and India and China, for the BRICS group.

The implication of the findings of this study is that, faced with shocks to the LSCI, bilateral trade in the G7 economies will most likely recover more quickly than in the economies of the other country-groups. Findings from the study show that more than 85 percent of countries in the G7 country-group exhibit low persistence. This is unsurprising given that the G7 countries represent the most advanced countries in the world, possessing the resources to both ward off potential threats to the movement of container ships originating from or going to their ports and to have the capacity to speedily implement measures to enhance the movement of container ships originating from their countries. However, in the MINT economic group, 50 percent of the economies present low persistence, compared to about 40 percent in BRICS economies. In general, BRICS and MINT economies have shown high persistence in liner shipping, given that they are not as advanced as the G7 countries. Hence, long-term policies aimed at reducing congestion, and the design and construction of ships, will make transportation of goods over long distances economical and help build the capacity of these country-groups to recover more quickly from shocks to trade as measured through the LSCI. Furthermore, given that larger economies will recover more quickly, following a shock to shipping connectivity than smaller economies, where potentially severe consequences are more likely, efforts must be made to reduce tensions, such as trade wars, that make the movement of goods across the world difficult.

According to Hoffmann *et al.*, (2020), and Fugazza and Hoffmann (2017), given that shipping connectivity is an important determinant of bilateral trade, we can make the following conclusion based on the findings concerning the persistence of the LSCI, which is the focus of this study:

- Bilateral trade in an overwhelming number of G7 countries will recover quickly in the event of a shock, given the result of the persistence test on the LSCI.
- In MINT countries, bilateral trade of half of them will recover more easily following a shock to the LSCI. For the other half, testing persistence through fractional differencing is not appropriate.
- In BRICS economies, international trade of fewer than half of the countries will revert quickly to its previous mean level.
- Being in the group with the most developed economies, countries in the G7, considering their size, available resources, and maritime sophistication and connections, can more easily recover from a shock to bilateral trade occasioned by a shock to the LSCI.

Finally, given that this study has demonstrated bilateral trade rebounds quickly in most of the developed economies considered than in less developed economies, care must be taken to ensure that global trade through liner shipping does not suffer undue shocks that may potentially cause delays and disrupt supply chains.

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