6

MARITIME TRANSPORT CONNECTIVITY

Globalized production, trade, communication and finance depend on connectivity, that is, the possibilities for people, companies and countries to connect with each other. UNCTAD has led the research on shipping connectivity since the first publication of the liner shipping connectivity index in 2004.

More recently, "[c]onnectivity has become a buzz word in development and international economics … . Viewing economic and social ties as isolated point-to-point interactions is losing ground to more comprehensive approaches, in which 'networks' are increasingly becoming the unit of analysis" (World Bank, 2013a). The Group of 20 launched the Global Infrastructure Connectivity Alliance to improve the "linkages of communities, economies and nations through transport, communications, energy and water networks" (Global Infrastructure Connectivity Alliance, 2016). In the same vein, Aid for Trade at a Glance 2017 focuses on promoting trade, inclusiveness and connectivity for sustainable development (World Trade Organization, 2017). In a contribution to the aforementioned report, OECD and UNCTAD (2017) point out that "while digital connectivity can provide new opportunities for developing countries to participate in international trade, traditional trade costs related to physical connectivity can still represent a significant barrier to the physical delivery of goods". World Bank (2013b) concludes that "[m]aritime transport connectivity and logistics performance are very important determinants of bilateral trade costs: in some specifications, their combined effect is comparable to that of geographical distance". Improved liner shipping connectivity can help reduce trade costs and has a direct, positive bearing on trade volumes. This is confirmed by numerous studies on trade, seaports and shipping networks (see Wilmsmeier et al., 2006; Sourdin and Pomfret, 2012; Wilmsmeier, 2014; Ducruet, forthcoming; Fugazza and Hoffmann, 2017; Hoffmann et al., 2017; Wilmsmeier et al., 2017; and Geerlings et al., forthcoming, and the extensive literature referred to therein).

Given that maritime shipping continues to be the main mode of transport for most developing countries' foreign trade, this chapter begins by introducing the concept of maritime transport connectivity at the country level and for bilateral connections (section A). It then discusses in more detail two areas where maritime connectivity could be improved, notably the potential of connecting domestic and international shipping services (section B) and trade and transport facilitation measures that could enhance maritime connectivity (section C). Concluding section D presents policy options and recommendations, building upon the six chapters of the Review.

MARITIME CONNECTIONS

Country pairs that add a direct route tend to see a reduction in trade costs of 9 percentage points

BEST CONNECTED COUNTRIES PER REGION

Cabotage can enhance operational efficiency along the supply chain, address concerns related to carbon dioxide emissions and energy efficiency and trade prospects through trans-shipment

The potential of cabotage is higher in countries with longer coasts or in countries with islands, where the alternative road transport is costlier or not available

A. CONTAINER SHIP DEPLOYMENT AND LINER SHIPPING CONNECTIVITY

Most manufactured goods are transported by containerized liner shipping services. Container ships have a fixed schedule and call at several ports during a journey. Containers with goods belonging to different shippers are loaded, trans-shipped or unloaded in each port. This type of service is comparable to a city's metro network, where metro stations are connected to one or more lines. Passengers will look at timetables and options to change from one line to another to arrive at a destination. For liner shipping services, the "connectivity" of different countries can be compared by consulting ship schedules and considering options to connect to overseas markets through the liner shipping network.[1]

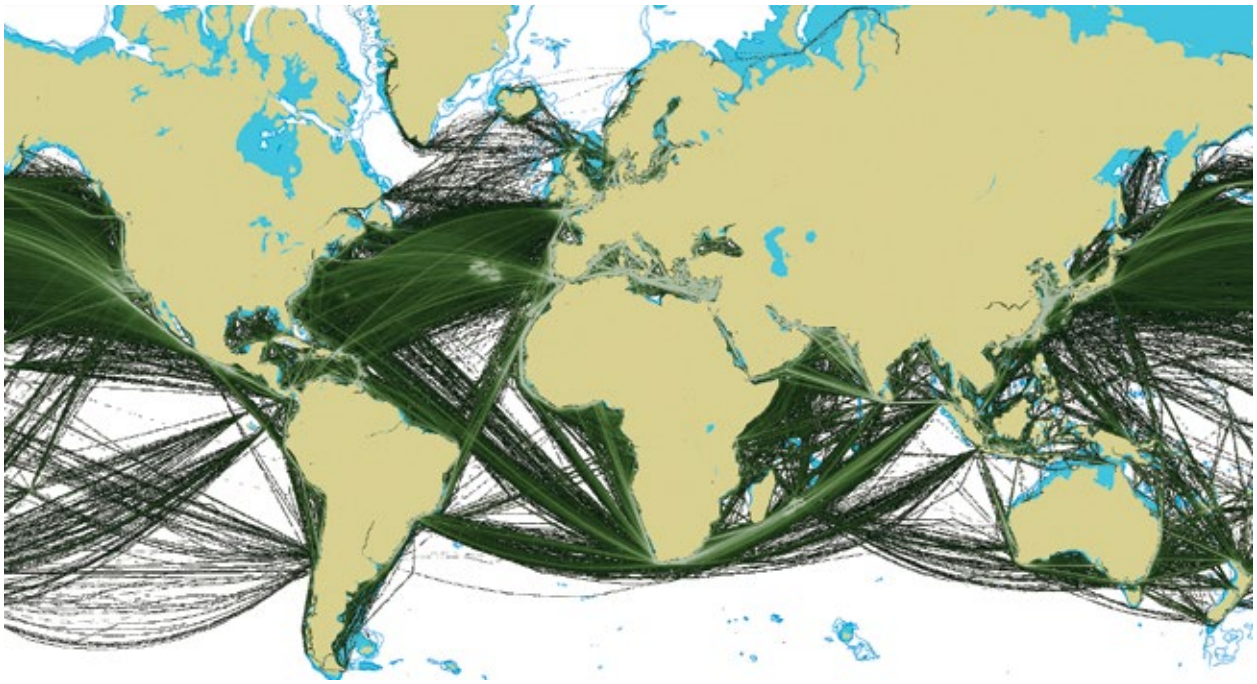
Figure 6.1 depicts the density map of container ships in 2016. The key nodes of the network are Malacca, Panama, the Strait of Gibraltar and Suez, and traffic is denser in general in the northern hemisphere than in the southern hemisphere, with exceptions, for example around Santos (Brazil), South Africa and Mauritius. Some locations are better connected than others, and it is worthwhile to understand the reasons for these differences and options for improvement.

1. Country-level liner shipping connectivity

To compare and analyse countries' positions within the global liner shipping network, UNCTAD in 2004 developed the liner shipping connectivity index. The index, generated from the schedules of the world's container shipping fleet, uses five components: the number of ships deployed to and from each country's seaports, their combined container-carrying capacity, the number of companies that provide regular services, the number of services and the size of the largest ship.[2] The methodology has remained constant since 2004 and is not dependent on samples, surveys or perceptions. Figure 6.2, panels (a) – (h), illustrates index trends in selected regions.

On the west coast of South America, Panama is the best-connected country of the subregion (figure 6.2(a)). Panama benefits from the Panama Canal, which has encouraged the establishment of trans-shipment ports. Chile and Peru have largely the same level of connectivity, as both countries are served by the same companies and ships. Ecuador is still lagging behind; initially, its main seaport, Guayaquil, was among the last to invest in ship-to-shore container gantry cranes and is hindered by draft restrictions in comparison with the other main ports on the west coast of South America. This example shows that ports along a same route also depend on investments made in other ports served by the same lines. If – for example – only one port invests in container-handling equipment while other ports on the same route do not, ships will need to bring their own gear, and potential savings on the seaside are not achieved. On the west coast of South America, Chile was among the first to invest in ship-to-shore container cranes, and for many years, many ships calling at San Antonio or Valparaiso, Chile continued to sail with

Figure 6.1. Density map of container ship movements



Source: Prepared for UNCTAD by Marine Traffic.
Note: Data depict container ship movements in 2016.

their own cranes, because they needed them in Callao, Peru; Guayaquil, Ecuador or Buenaventura, Colombia. Today, such differences have prompted a trend towards hub-and-spoke networks, and ports like Guayaquil are often served by feeder services with trans-shipment, principally in Panama.

On the east coast of South America (figure 6.2 (b)), Argentina, Brazil and Uruguay are served by the same lines. Although Uruguay is a much smaller economy, it accommodates the same services, not only for its own imports and exports, but also for transit cargo from Paraguay and trans-shipment services into Argentina and Brazil, where cabotage restrictions limit the trans-shipment potential of domestic ports.

In Africa, the best-connected countries are Egypt, Morocco and South Africa (figure 6.2 (c)). Morocco has seen a sharp increase of its liner shipping connectivity index because of the trans-shipment hub Tanger–Mediterranean. In Eastern Africa, Djibouti has significantly improved its connectivity, benefiting from its geographical position and private investments in the trans-shipment hub (figure 6.2 (d)).

On the Arabian Peninsula, the United Arab Emirates, with its hub port in Dubai, has maintained the highest liner shipping connectivity index of the subregion (figure 6.2 (e)). Several countries have benefited from their geographic position, linking East–West services between Europe and Asia to North–South and feedering services that connect their ports to Africa and Southern Asia.

In Southern Asia, Sri Lanka has bypassed its neighbours. Colombo accommodates large container ships that are deployed on services between Asia and Europe, as well as some services to Africa and South America (figure 6.2 (f)). Feedering from Colombo to ports in India can be done with ships under any flag, as these services are not affected by the Indian cabotage restrictions.

In South-East Asia, Singapore and Malaysia are largely served by the same lines in their Asia–Europe services, and their liner shipping connectivity index moves mostly in parallel (figure 6.2 (g)). In some years, however, the index reflects competition for trans-shipment services. For example, in 2007, Maersk left Singapore for Malaysia for most trans-shipment operations. The other countries in the subregion have not seen improvements in their index, as they continue to connect to overseas markets largely through trans-shipment services via Singapore and Malaysia.

In Eastern Asia, China boasts the highest liner shipping connectivity index, as its ports are the world's major loading locations (figure 6.2 (h)). For many years, Hong Kong (China) and the Republic of Korea benefited from connecting Chinese and Japanese services to the global liner network through their trans-shipment hubs. With growing trade volumes and revised cabotage regulations for trans-shipment in Shanghai, ships increasingly call directly at ports in China, and the need for trans-shipment in Hong Kong (China) and the Republic of Korea has decreased.

Small island developing States in all regions are characterized by low levels of connectivity. Examples from table 6.1 include Antigua and Barbuda in the Caribbean (four ships on two services), Sao Tome and Principe in the Atlantic (five ships on two services), Maldives in the Indian Ocean (two ships on two services), and Nauru and Tuvalu in the Pacific (one ship on one service). Mauritius, on the other hand, has attracted ships of more than 10,000 TEUs, with 16 ship operators deploying 75 ships on 13 services to and from the island.

The largest container ships of up to 18,506 TEU capacity are deployed on services between Europe and Eastern Asia, calling also at ports in Southern and South-East Asia and in Northern Africa (Morocco). The largest ships deployed on services to North America carry up to 13,950 TEUs.

The liner shipping connectivity index illustrates trends in different countries. For a more detailed analysis, it is also useful to look at the components of the index. Table 6.1 provides data relating to the five components for selected countries (May 2017). Annual deployed container-carrying capacity varies between 6,156 TEUs for Tuvalu and more than 85 million TEUs for China; there were 1,996 container ships scheduled on liner services to and from Chinese ports, compared with just one ship for Tuvalu. Small island developing States in all regions must deal with low levels of connectivity.

Container ship deployment to seaports in Egypt and Panama is similar overall, even though the maximum ship size that can pass through the Suez Canal is far larger than what is allowed through the Panama Canal, even after the latter's expansion. The larger ships that pass through the Suez Canal do not make use of Egyptian seaports. In Africa, Togo is served by ships of up to 10,309 TEU capacity, connecting Western and Southern Africa (including Mauritius) to Eastern Asia. Ships calling at ports in Ghana, Kenya, or Nigeria have less than half of that capacity. Steps policymakers can take to attract more companies, ships and services are discussed later in this chapter; further details about the structure of the global liner shipping network and country-pair (bilateral) connectivity are provided below.

2. Bilateral liner shipping connectivity

Less than 20 per cent of coastal country pairs have a direct maritime connection between them, meaning that containerized goods can be transported

Figure 6.2. Liner shipping connectivity index, 2004–2017: (a) West Coast, South America; (b) East Coast, South America; (c) African hubs; (d) Eastern Africa; (e) Western Asia; (f) Southern Asia; (g) South-East Asia; and (h) Eastern Asia

Source: UNCTAD secretariat calculations. For the liner shipping connectivity index of each country, see http://stats.unctad.org/LSCI; for the calculation, see endnote 2.

Table 6.1. Country-level container ship deployment, selected countries, May 2017

Country	Deployed annual capacity (TEUs)	Number of ships scheduled on services	Number of services	Maximum ship capacity (TEUs)
Antigua and Barbuda	78 832	4	2	1 116
Chile	4 187 451	129	21	11 629
China	85 347 681	1 996	463	18 506
Democratic Republic of the Congo	173 662	15	7	1 005
Egypt	12 110 793	293	71	14 167
Germany	26 427 472	621	143	18 350
Ghana	1 866 259	111	18	4 596
Kenya	1 815 648	71	17	4 013
Malaysia	36 663 697	906	196	18 506
Maldives	64 256	2	2	1 118
Mauritius	2 339 459	75	13	10 409
Micronesia	9 360	3	1	624
Morocco	12 053 640	312	68	18 350
Myanmar	809 958	43	17	1 468
Nauru	16 276	1	1	626
Nigeria	3 262 826	179	27	4 535
Panama	11 943 496	357	62	12 041
Republic of Korea	40 924 768	1 017	245	18 506
Sao Tome and Principe	41 145	5	2	2 006
Sri Lanka	13 719 661	327	59	18 350
Togo	2 302 871	90	15	10 409
Tuvalu	6 156	1	1	513
United Arab Emirates	20 468 669	393	94	17 387
United States	36 154 504	990	200	13 950
Venezuela (Bolivarian Republic of)	555 826	30	16	2 139

Source: UNCTAD secretariat calculations based on data provided by MDS Transmodal.
Note: The container ship-carrying capacity indicated in this table is not fully comparable to the capacity indicated in chapter 2. For the purposes of chapter 6, only the capacity to transport full containers is considered – reported vessel sizes in TEUs in this table are slightly smaller than those in chapter 2.

between a country of origin and a destination without the need for trans-shipment. The average number of direct maritime connections is half as high in developing countries compared to developed ones.

Table 6.2 provides examples of bilateral fleet deployment to illustrate the different aspects of bilateral connectivity. The highest direct bilateral connectivity is between China and the Republic of Korea. In general, there are high levels of connectivity between neighbouring countries. For instance, ships may call at the ports of two neighbouring countries; some transport bilateral trade between the two countries or call at trans-shipment ports as feeder vessels, and the same ships may transport exports from the two neighbouring countries to third countries.

More than 80 per cent of country pairs do not have a direct connection. This includes large trading nations that lie across the same ocean, for example, Brazil and Nigeria. An interesting question for trade and transport analysts is whether there are no direct connections between the two countries because there is not enough demand, or whether there is not much trade between them because the two trading partners are not well connected. As discussed below, there is evidence for both.

Because of containerization and trans-shipment, any country can effectively trade with another country, even if there is no direct service connecting the two. To capture the level of bilateral connectivity for those cases where there is no direct service, UNCTAD developed the bilateral liner shipping connectivity index (Fugazza and Hoffmann, 2016; Hoffmann et al., 2014). Unlike the country-level index, which provides an index value per country, the bilateral liner shipping connectivity index provides 160 values per country, namely a coastal country's connectivity with other coastal countries.

The bilateral liner shipping connectivity index is generated from five components. For a pair of countries A and B, the index is based on the following factors: the number of trans-shipments required to get from country A to country B, where a lower number leads to a higher index; the number of direct connections common to both countries; the geometric mean of the number of direct connections of countries A and B; the level of competition on services that connect country A to country B; and the size of the largest ships on the weakest route connecting country A to country B.[3] The index is symmetrical; in other words, what characterizes liner services from country A to country B also characterizes services from country B to country A.

Table 6.2. Bilateral container ship deployment, selected country pairs, May 2017

Country pairs	Deployed annual capacity (TEUs)	Number of ships scheduled on services	Number of services	Maximum ship capacity (TEUs)
Antigua and Barbuda–Saint Kitts and Nevis	78 832	4	2	1 116
Argentina–Brazil	4 358 270	115	19	9 635
Australia–Singapore	2 650 466	91	17	6 380
Bangladesh–Malaysia	1 612 738	40	16	2 457
Brazil–India	-	-	-	-
Cambodia–Thailand	693 801	34	9	2 181
Cameroon–Gabon	211 154	19	4	3 149
Chile–Peru	3 877 925	119	17	11 629
Chile–Singapore	-	-	-	-
China–Netherlands	11 456 912	156	14	18 506
China–Republic of Korea	38 356 591	911	180	18 506
China–United States	19 331 964	427	57	13 950
Colombia–Panama	6 527 459	203	29	11 629
Djibouti–Saudi Arabia	1 988 139	57	9	8 966
Ecuador–Panama	1 625 393	74	12	9 227
Egypt–Italy	6 090 427	152	30	14 167
Gabon–Namibia	4 260	1	1	710
Germany–Netherlands	19 879 996	409	62	18 350
India–Sri Lanka	6 982 551	150	37	11 569
Kenya–United States	-	-	-	-
Madagascar–France	720	2	1	60
Marshall Islands–Fiji	61 994	7	3	1 617
Mauritius–South Africa	1 451 832	36	4	10 409
Nigeria–Brazil	-	-	-	-
Togo–China	1 201 361	44	4	10 409

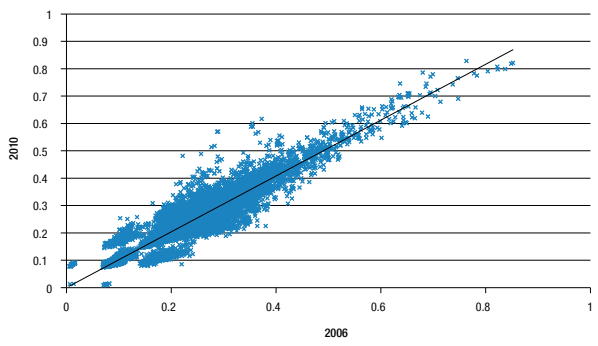
Source: UNCTAD secretariat calculations based on data provided by MDS Transmodal.
Note: Country pairs with no information provided (on this table) do not have a direct liner connection.

Figure 6.3 compares the bilateral liner shipping connectivity index over two periods: panel (a) compares 2010 values with those of 2006, and panel (b) compares 2016 values with those of 2010. Points above (below) the 45-degree line represent country pairs whose index has increased (decreased). Between 2006 and 2010, 61 per cent of country pairs saw an improvement of their index. The figure increases to 68 per cent between 2010 and 2016. The index stagnated for most country pairs in the immediate aftermath of the 2008 economic and financial crisis and began increasing only after 2010.

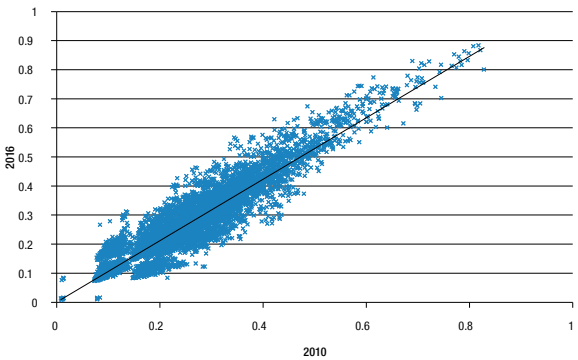
An analysis of the components of the bilateral liner shipping connectivity index reveals that the average number of trans-shipments required to transport a container from one country to another has grown over the years. This is in line with industry trends. As ships become larger and alliances make more and more use of hub ports from where ships with the most appropriate vessel size for each leg of the total route are assigned, the number of direct services decreases. This reflects the continued need for an optimization of shipping line networks (MDS Transmodal, 2017).

Figure 6.3. Bilateral liner shipping connectivity index trends, (a) 2006–2010 and (b) 2010–2016

(a)



(b)



Source: UNCTAD secretariat calculations, based on data from the UNCTAD liner shipping connectivity matrix (internal database).

Table 6.3. Top 25 country pairs ranked according to the bilateral liner shipping connectivity index, 2006, 2010 and 2016

Country pairs		Rank in 2006	Rank in 2010	Rank in 2016
Netherlands	United Kingdom	2	2	1
Netherlands	Belgium	5	4	2
United Kingdom	Belgium	1	3	3
Netherlands	Germany	6	7	4
Germany	Belgium	3	6	5
Republic of Korea	China	17	10	6
Singapore	Malaysia	16	5	7
United Kingdom	Germany	4	9	8
United Kingdom	France	8	11	9
France	Spain	10	35	10
United Kingdom	Spain	14	18	11
Netherlands	Spain	19	20	12
Malaysia	China	46	15	13
Spain	Belgium	18	19	14
Singapore	China	23	8	15
Netherlands	France	11	13	16
France	Belgium	7	12	17
Spain	Germany	25	22	18
Hong Kong (China)	China	9	1	19
France	Germany	12	17	20
Singapore	Republic of Korea	55	26	21
Italy	Spain	15	21	22
Malaysia	Republic of Korea	89	71	23
China	Belgium	36	25	24
Spain	China	57	32	25

Source: UNCTAD secretariat calculations, based on data from the UNCTAD liner shipping connectivity matrix (internal database).

In addition to European countries, five Asian countries are found among the top 25 country pairs (table 6.3). Their presence is more marked in 2016 and 2010 than in 2006. A deeper analysis shows that the top 50 bilateral liner shipping connectivity indices are only found on connections between 15 countries and that the top 250 indices are for connections between 40 countries. Bottom country pairs essentially include small and remote islands such as the Cook Islands, Montserrat and Nauru, and the least developed countries.

The definition and construction of the bilateral liner shipping connectivity index, based on hard fleet deployment data, rather than perceptions or surveys, is clearly of empirical interest. The index and its components have a direct bearing on trade costs, and liner shipping connectivity plays a crucial role in determining a country's trade performance. All other factors remaining equal, an increase by one unit (equivalent to a variation of 0.01) of the index is associated with an increase of the value of exports of containerizable goods by 3 per cent. Lacking a direct maritime connection with a trade partner is associated with lower export values; any additional trans-shipment is associated with a 40 per cent lower bilateral export value. An additional common direct destination is associated with about a 5 per cent higher bilateral export value. An increase by 1,000 TEUs of the largest ship operating on any leg of a maritime route is associated with an increase in bilateral export values of 1 per cent (Fugazza and Hoffmann, 2017; Fugazza, 2015).[4] Building on data from the UNCTAD liner shipping connectivity matrix, Shepherd (forthcoming) estimates that a reduction in trade costs of 9.09 percentage points can be achieved when country pairs add a direct maritime connection.

The construction and use of the UNCTAD indices on liner shipping connectivity go beyond empirical considerations. The possibility to monitor changes in the indices and their components over time can also help frame practical policy orientations. The data set offers a unique view of the liner shipping network, offering the possibility to understand and take into consideration the position in that network of a specific country or country pair. The indices can therefore be useful monitoring instruments and benchmarks for policymaking.

The next two sections discuss in detail two policy areas where a country's maritime transport connectivity can be improved. Section B looks at maritime cabotage – domestic shipping services – which could be linked to international shipping services, thus potentially improving a country's international connectivity. Second, section C focuses on trade and transport facilitation, through which a country's seaports can be made more attractive to its clients, that is to say, shipping lines and shippers.

B. MARITIME CABOTAGE: INTRACOUNTRY CONNECTIVITY AND GLOBAL SHIPPING NETWORKS

For any country with more than one seaport, in principle domestic and feedering traffic could be transported by sea. The potential for cabotage operations is higher in countries with longer coast lines or in countries with islands, where the alternative of trucking or rail transport is costlier or not available.

1. Domestic liner shipping connectivity

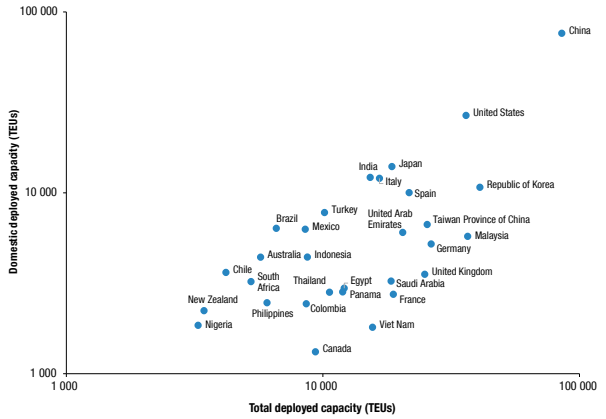
To provide an indication of potential containerized cabotage transport, table 6.4 shows the fleet deployment of liner shipping companies on services to and from a country's seaports. Figures 6.4 and 6.5 portray the relationship between total container shipping connectivity and domestic, or intracountry connectivity.

Table 6.4. Container ship deployment on domestic services, top 30 countries, May 2017

Rank (domestic deployed TEUs)	Country	Total vessel deployment					Domestic vessel deployment									
		Deployed annual capacity (TEUs)	Number of ships scheduled on services	Number of operators	Number of services	Maximum ship capacity (TEUs)	Deployed annual capacity (TEUs)	Percentage of total	Number of ships scheduled on services	Percentage of total	Number of operators	Percentage of total	Number of services	Percentage of total	Maximum ship capacity (TEUs)	Percentage of total
1	China	85 347 681	1 996	907	463	18 506	76 210 452	89	1 738	87	757	83	348	75	18 506	100
2	United States	36 154 504	990	437	200	13 950	26 758 518	74	755	76	315	72	124	62	13 950	100
3	Japan	18 584 569	594	291	204	12 939	13 960 932	75	462	78	252	87	181	89	9 041	70
4	India	15 291 675	371	164	90	11 569	12 158 250	80	290	78	117	71	62	69	11 569	100
5	Italy	16 614 787	454	162	103	14 167	12 017 710	72	318	70	114	70	72	70	14 167	100
6	Republic of Korea	40 924 768	1 017	465	245	18 506	10 725 845	26	286	28	160	34	99	40	18 348	99
7	Spain	21 685 890	605	213	151	18 506	10 016 158	46	269	44	107	50	73	48	14 167	77
8	Turkey	10 147 068	285	117	89	13 336	7 776 117	77	205	72	84	72	59	66	13 336	100
9	Taiwan Province of China	25 504 073	601	291	146	14 000	6 676 775	26	180	30	95	33	68	47	13 840	99
10	Brazil	6 581 330	175	55	31	9 635	6 359 090	97	168	96	49	89	25	81	9 635	100
11	Mexico	8 535 960	259	85	47	11 629	6 287 321	74	172	66	56	66	27	57	11 629	100
12	United Arab Emirates	20 468 669	393	158	94	17 387	6 036 511	29	118	30	52	33	31	33	12 183	70
13	Malaysia	36 663 697	906	365	196	18 506	5 739 593	16	156	17	79	22	53	27	13 908	75
14	Germany	26 427 472	621	253	143	18 350	5 213 249	20	125	20	39	15	35	24	18 341	100
15	Indonesia	8 700 671	290	146	117	8 704	4 412 786	51	184	63	85	58	77	66	4 400	51
16	Australia	5 717 420	206	91	49	6 380	4 406 863	77	157	76	63	69	32	65	6 380	100
17	Chile	4 187 451	129	40	21	11 629	3 629 957	87	113	88	32	80	18	86	11 629	100
18	United Kingdom	24 946 063	594	235	139	18 506	3 544 693	14	75	13	38	16	30	22	18 350	99
19	Saudi Arabia	18 444 508	354	137	59	14 159	3 248 576	18	60	17	29	21	13	22	11 421	81
20	South Africa	5 247 559	192	57	32	10 409	3 230 349	62	104	54	31	54	17	53	10 409	100
21	Egypt	12 110 793	293	107	71	14 167	2 968 621	25	65	22	32	30	21	30	6 571	46
22	Panama	11 943 496	357	114	62	12 041	2 829 557	24	89	25	24	21	14	23	9 040	75
23	Thailand	10 615 263	338	172	90	8 750	2 821 477	27	112	33	66	38	36	40	1 867	21
24	France	18 823 473	466	176	87	17 387	2 746 237	15	86	18	22	13	14	16	16 277	94
25	Philippines	6 056 224	195	92	76	4 818	2 468 508	41	98	50	46	50	43	57	3 477	72
26	Colombia	8 617 348	298	89	52	11 629	2 434 631	28	84	28	28	31	20	38	9 863	85
27	New Zealand	3 441 670	136	51	32	9 890	2 229 011	65	98	72	42	82	24	75	4 614	47
28	Nigeria	3 262 826	179	41	27	4 535	1 851 505	57	86	48	20	49	12	44	4 508	99
29	Viet Nam	15 616 632	487	230	128	13 504	1 804 686	12	61	13	28	12	25	20	2 550	19
30	Canada	9 351 366	259	113	45	11 293	1 320 349	14	41	16	15	13	9	20	8 500	75

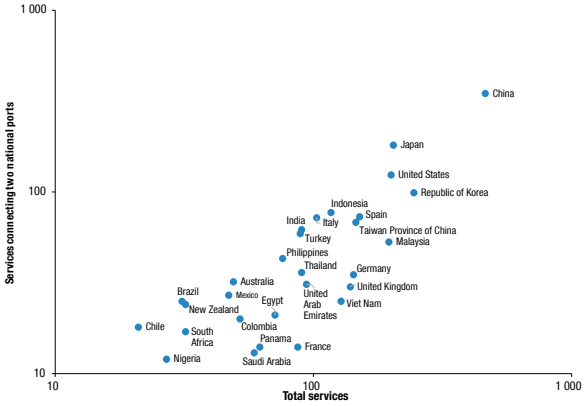
Source: UNCTAD secretariat calculations, based on data provided by MDS Transmodal.

Figure 6.4. Domestic and total 20-foot equivalent unit capacity deployed, May 2017



Source: UNCTAD secretariat calculations, based on data provided by MDS Transmodal.

Figure 6.5. Domestic and total number of container shipping services, May 2017



Source: UNCTAD secretariat calculations, based on data provided by MDS Transmodal.

As previously highlighted, many countries impose restrictions on international operators to transport domestic trade or to provide feedering services. This leads to situations where a ship may call at two ports within the same country, but is not allowed to transport cargo between the two ports. The data in table 6.4 and figures 6.4 and 6.5 give an indication of potential maritime transport of domestic trade. However, in view of the aforementioned restrictions, the data are not necessarily an indication that such transport is taking place.

Countries with long coast lines or islands often count on container shipping services that call at more than one domestic port. A comparison of Brazil and Germany, for example, reveals that Germany has a higher liner shipping connectivity than Brazil, with more companies providing services to German seaports than to ports in Brazil. However, most of these companies only call at either the ports of Hamburg or Bremerhaven but not both, while in Brazil, with its longer coast line, many operators call at the port of Santos and a second port. Hence, the intracountry container shipping connectivity is higher for Brazil than for Germany. Other countries for which domestic vessel deployment represents a high share of overall vessel deployment are Chile, China, India and Turkey.

A common feature of most countries in this situation is that the maximum TEU ship capacity deployed on intracountry services is the same as the maximum overall TEU ship capacity. This is an indication that intracountry connections form part of an international service. If in such a case an international operator is not allowed to carry domestic cargo between two ports of call in a given country, this restricts the potential supply of transport services, and thus represents a missed opportunity for maritime cabotage transport. It will also discourage the modal shift from land to sea transport.

2. Trans-shipment and feedering services

Countries with large cabotage potential may find themselves in a situation where ports in neighbouring countries become the hub ports for their own cabotage or feedering services. Montevideo, Uruguay, for example, acts as a relay port for services that connect ports in Argentina or Brazil (Brooks et al., 2014). Colombo, Sri Lanka benefits from cabotage restrictions in India, as global liner operators call at the port of Colombo, and from there international feedering services can connect to seaports in India.

Increased seaborne trade resulting from the recent Chinese economic boom had prompted several countries in Asia to compete for trans-shipment. Since 2013, China has gradually relaxed cabotage restrictions within the Shanghai free trade area in a bid to promote the area and boost the trans-shipment volumes of Shanghai. As a result, foreign registered vessels may now carry containers between Shanghai and other Chinese ports – although vessels must still have Chinese owners. Previously the formal position was that this could only be done by Chinese-owned and -flagged vessels, thereby preventing the use of, among others, foreign flagged ships of the China Ocean Shipping (Group) Company and China Shipping Container Lines. This recent change has raised concerns about Hong Kong (China), owing to its decreasing throughput and connectivity (see also the declining liner shipping connectivity index in 2016, figure 6.2(h)). Protecting the role of Hong Kong (China) as a trans-shipment hub had been one of the reasons for the mainland's restrictions on cabotage, in addition to protecting the domestic shipping lines and security concerns of China.

In India, cabotage regime changes were recently introduced in the context of broader reforms related to improving logistics for trade and competitiveness, reducing costs. The Government has relaxed cabotage restrictions for specialized vessels, which are short in supply. In this case, enabling the trans-shipment of containers through foreign flagged vessels would encourage a modal shift from road and rail to coastal shipping (MDS Transmodal, 2016).

In Malaysia, the modification of the cabotage policy is partly due to the rising cost of consumer goods. Goods exported from Eastern Malaysia are left in transit for prolonged periods of time because vessels travelling out of Eastern Malaysia are unable to carry a full load. Consequently, manufacturers in Eastern Malaysia lose their ability to compete in the market because by the time their goods arrive at the port of discharge, the prices of those goods are no longer competitive. The delay and issue of vessel frequency has also resulted in increased port charges and a risk of cargo theft. Additionally, goods transported from peninsular Malaysia to Eastern Malaysia pass through a long supply chain before being discharged, resulting in increased freight costs. The lack of transport options and a monopolized shipping industry has led to consumers having to pay the price of a cabotage policy that from the onset sought only to benefit the domestic shipping industry. Lifting cabotage laws could make Eastern Malaysian ports more accessible, increase trading activities and gain prominence attracting container traffic routes going through the Straits of Malacca.

New Zealand is also an interesting case. The country's regulation of coastal shipping has been allowing foreign registered vessels to go from one local port to another since 1994. The regulation foresees that access to coastal trade is restricted to New Zealand flagged ships or foreign ships on bareboat charter to a New Zealand-based operator. The regulation also allows for cabotage transport if a foreign ship that is passing through New Zealand waters is on a continuous journey from a foreign port to another foreign port and is stopping in New Zealand to load or unload international cargo. This exception has benefited the country from the perspective of reduced freight rates and thus improved trade competitiveness. As a result, thousands of empty containers have been repositioned in the South for loading and returning north, or heading for export markets (Thompson and Cockrell, 2015; Graham, 2003).

Current trends in shipping networks suggest that potential benefits from connecting cabotage services to international services will increase. First, there is continued growth in the average size of ships, which require deeper ports and larger areas for handling ships and containers. Such infrastructure investments are costly. Second, the difference in size between the largest and the smallest ships will also increase, making it more economical to trans-ship containers in order to benefit from the optimum vessel size for different legs of the total route. Third, there is continued pressure to reduce costs and increase efficiency along the entire supply chain. Not making use of potential cost savings will be more and more difficult to justify. Furthermore, there is a growing awareness and mainstreaming of sustainability criteria in public policies; the promotion of short sea shipping is one way to reduce carbon dioxide emissions, as shipping is more energy efficient than other modes of transport.

C. TRADE AND MARITIME TRANSPORT FACILITATION

Many international agreements are in place to support trade and transport facilitation. They include the revised International Convention on the Simplification and Harmonization of the World Customs Organization and United Nations transport facilitation conventions, managed, among others, by the Economic Commission for Europe. One such example is the Convention on International Transport of Goods under Cover of TIR [international road transport] Carnets. In addition, many international standards and guidelines cover international trade procedures, such as recommendations of the Economic Commission for Europe and the United Nations Centre for Trade Facilitation and Electronic Business. These conventions and standards contribute to facilitating elements of the trade transaction chain. This section focuses on trade and transport facilitation measures included in the Agreement on Trade Facilitation of the World Trade Organization, as well as the IMO Convention on Facilitation of International Maritime Traffic, which focuses on maritime shipping.

1. Agreement on Trade Facilitation

The Agreement on Trade Facilitation entered into force on 22 February 2017. The Agreement underlines that efficient movement of goods across borders is a priority of the global trade agenda, both for the trading community and individual countries. It also shows a shift in the focus and operation of the multilateral trading system, previously driven essentially by market access negotiations. Instead of negotiating the legal aspects of market access, the focus has shifted to improving physical market access through improved procedures and connectivity.

The Agreement sets forth procedures for expediting the movement, release and clearance of goods across borders with a view to reducing related costs, while at the same time ensuring safety and security of trade goods through efficient compliance controls. Such procedures tend to be less advanced in developing countries compared with developed countries. The Agreement contains ground-breaking rules on special and differential treatment, linking the implementation by

developing countries and the least developed countries to the attainment of technical capacity.

Against this background, the Agreement on Trade Facilitation has the potential to significantly reduce trade costs for import, export and transit procedures if the procedures contained in the Agreement are implemented in full. According to OECD estimates, the reduction of total trade costs following full implementation of the Agreement is 16.5 per cent for low-income countries, 17.4 per cent for lower middle-income countries, 14.6 per cent for upper middle-income countries, and 11.8 per cent for OECD countries (Moïsé and Sorescu, 2013). Fully implementing the Agreement would have a greater global impact on trade costs than eliminating all tariffs (World Trade Organization, 2015). OECD and UNCTAD (2017) estimate that full implementation of the Agreement would boost trade flows by 0.6 per cent and increase GDP by between 0.04 and 0.41 per cent, depending on a country's level of development. UNCTAD (2016) discusses the close statistical correlation not only between specific measures of the Agreement and trade competitiveness, but also between trade facilitation reforms and the achievement of the Sustainable Development Goals on strengthening governance and formalizing the informal sector.

Reliability and speed of maritime trade transactions

Article 7 of the Agreement on Trade Facilitation sets forth measures for the timely release and clearance of goods. At the same time, this measure encourages investment in the electronic processing of trade clearance procedures, including payment and electronic submissions of declarations and pre-arrival processing, thus reducing the time goods spend at borders. Similarly, article 10 on formalities relating to importation, exportation and transit provides incentives for the integration of informal trade into the formal economy. Indeed, the implementation of both articles have a stronger positive bearing on a country's Doing Business Index indicator for trading across borders, as suggested by the data obtained from a country-by-country analysis of the number of notifications on the date of the entry into force of the Agreement. Measures enhancing predictability have the greatest influence on imports and exports of value added goods. In this respect, advance ruling measures affect imports, while measures relating to the availability of trade-related information affect exports (OECD and UNCTAD, 2017).

Stakeholder collaboration

The entry into force of the Agreement also promotes public–private partnerships. Under article 23.2, Members of World Trade Organization are required to have in place national trade facilitation committees, which are platforms where representatives from the public and private sectors, including the port community, consult, inform, coordinate and engage in strategies towards the successful implementation of the Agreement and trade facilitation in general. Such a mechanism is crucial for ensuring political buy-in from relevant stakeholders, including users and providers of trade and transport-supporting services.

Strengthening the port community system

Implementation of the Agreement can also strengthen the port community system by enabling neutral and open electronic platforms, such as the single window, where stakeholders from the public and private sectors exchange information for the clearance of goods to improve the efficiency and competitive position of maritime communities.

Article 10.4 of the Agreement requiring countries to establish and maintain single windows plays a key role in this endeavour. The single electronic submission of data optimizes and automates the performance of ports and logistics processes. Connecting transport and logistics chains also reduces the duplication of data and the number of steps in trade procedures. Other measures of the Agreement, such as electronic payment (article 7.2), can complement a single window environment. Many ports around the world have electronic port community systems for the exchange of data between port stakeholders. By linking or converting such systems to electronic single window systems, the entire transport and trade chain can be connected, thus linking or combining the logistics and commercial data information systems with the government clearance systems of customs and other border agencies, which in turn will speed up and streamline the trade process, making it more efficient.

Experience with the Automated System for Customs Data of UNCTAD suggests that single windows can have a strong, positive impact on the speed, reliability and transparency of trade procedures. Rwanda is a case in point. Remote offices of the Rwanda electronic single window based on the Automated System for Customs Data World platform located in ports of neighbouring countries of Kenya (Mombasa) and the United Republic of Tanzania (Dar es Salaam) helped reduce clearance times from 11 days in 2010 to 34 hours in 2014. Volumes of cargo inspected increased from 14 per cent in 2012 to 42 per cent in 2014 and reduced the cost of clearance from FR 30,000 to FR 4,000 in a one-year period, 2013–2014 (Trade Mark East Africa, 2015).

Connecting landlocked countries

Landlocked developing countries face additional challenges insofar as their trade flows and costs largely depend on the efficiency of customs and other border agencies, not only in their own countries but also of those in neighbouring transit countries. Against this background, article 11 seeks to improve the efficiency of transit operations requiring close coordination among a multitude of agencies on either side of a border. Landlocked developing countries and coastal transit developing countries benefit from the reduction of

bureaucratic tasks related to transit. Furthermore, the Agreement on Trade Facilitation offers a comprehensive treatment to transit issues by considering and dealing with transit in other provisions of the Agreement. For instance, the obligation to publish relevant information (article 1) and provide traders with an opportunity to comment on proposed new regulations before they enter into force (article 2) also includes transit.

Enhancement of regional connectivity

Facilitation of cross-border transit and trade is closely linked to regional integration and cooperation between neighbouring countries. The Agreement on Trade Facilitation encourages and contributes to regional connectivity. The benefits of domestic trade facilitation reforms are multiplied when such reforms are achieved with neighbouring countries and in a regional context with trading partners. In addition, intraregional connectivity helps eliminate geographical constraints, which can benefit small economies and landlocked countries. OECD and UNCTAD (2017) describe a strong, positive association between improvements in infrastructure and trade facilitation in neighbouring countries, on the one hand, and greater value chain connectivity at home, on the other. The Agreement includes articles on inter-agency collaboration and customs cooperation at the national and bilateral levels and allows for regional collaboration in setting up enquiry points, enhancing cooperation between neighbouring countries. Moreover, the Agreement attains this objective without requiring a multitude of regional trade agreements, making it unnecessary to process additional paperwork related to certificates of origin (UNCTAD, 2016).

2. Convention on Facilitation of International Maritime Traffic

The Convention on Facilitation of International Maritime Traffic is important for the maritime and ports sectors and contributes to improving connectivity in this field. The Convention is aimed at facilitating maritime transport by simplifying and minimizing formalities, data requirements and procedures associated with the arrival, stay and departure of ships engaged in international voyage. To this end, the annex to the Convention contains standards and recommended practices on formalities, documentary requirements and procedures that should be applied to ships, their crews, passengers, cargo and baggage on arrival, during their stay and on departure.

The Convention reduces to nine the number of declarations that can be required by public authorities. These standardized IMO forms include, inter alia, the general declaration, cargo declaration, crew and passenger lists, and dangerous goods manifest (IMO, 2017). IMO is currently working on a revision of the explanatory manual of the Convention with a view to updating the information.

D. OUTLOOK AND POLICY CONSIDERATIONS

Low transport connectivity remains a major hurdle for developing countries to connect to global markets. In particular, landlocked developing countries, small island developing States and other smaller and weak economies face considerable challenges in benefiting from trade opportunities, as they have access to fewer, less frequent, less reliable, more costly transport connections. As maritime transport continues to be the main mode of transport for the imports and exports of most developing countries, it is important to identify policies that help improve maritime transport connectivity. Based on the analysis provided in this issue of the Review, a number of conclusions and recommendations for policymakers, the international community and future work of UNCTAD can be drawn, as follows.

Data and research

Include maritime connectivity in planning and trade models. When negotiating trade deals, preparing trade policies or planning transport infrastructure investments, research and forecasts can be significantly improved if data on maritime transport networks are included. "Successful connectivity combines planning for scale economies, development of sustainable infrastructure capacity, efficient use of such capacity and economic inclusion aspects" (Global Infrastructure Connectivity Alliance, 2017). To this end, UNCTAD publishes two annual indices on maritime transport connectivity. It is recommended that further research be conducted on the specific components of shipping connectivity, as well as linkages to other dimensions of transport and trade connectivity.

Explore digital and other forms of connectivity. Better transport connectivity leads to lower trade costs and higher trade flows. At the same time, e-commerce, global value chains and advances in technology trigger further demand for better digital and other forms of connectivity. There are opportunities from modern network technologies, such as cargo and vessel tracking and numerous other digital developments, that can help enhance maritime connectivity. Researchers and policymakers need to consider maritime connectivity as a component of the broader dimensions of connectivity.

Shipping networks

Promote linkages between domestic, regional and intercontinental shipping services. Limitations to domestic or regional cabotage markets can lead to unnecessary inefficiencies and loss of maritime connectivity. Allowing international lines to also carry domestic trade and feedering cargo can enhance both the competitiveness of a country's seaports and the access of importers and exporters to international shipping services.

Ensure regional coordination. Most seaports can serve more than one country, be it through inland connections or via trans-shipment operations. Not every country can be host to the region's main hub port. For ports along the same route, it makes sense to plan port investments jointly to accommodate the vessels that are expected to serve this route in future. Regional organizations and international development partners can play an important role when planning port investments in countries within the same region.

Seaports and the hinterland

Investments in seaports and intermodal connections should be made. Important determinants of a country's maritime connectivity are beyond the control of policymakers. Notably, a country's geographical position and trade volumes are difficult to change. Investments can make a difference in domestic seaports. These investments may take the form of public–private partnerships, as most common user ports such as container terminals have in recent decades been concessioned or have involved the private sector in some other form.

Inter-port competition should be encouraged. Competitive pressures will encourage port operators to maximize their efficiency and pass on those efficiency gains to their clients, shippers and shipping lines. Inter-port competition should not be limited to domestic seaports, but to neighbouring countries' ports as well. Efficient trucking markets, rail and road infrastructure, and transit regimes are effective instruments for enhancing inter-port competition.

Trade and transport facilitation

Collaborative platforms should be built or strengthened. Under the Agreement on Trade Facilitation and Convention on Facilitation of International Maritime Traffic, members should establish committees in which stakeholders coordinate and cooperate in the implementation of trade and transport facilitation reforms. Ideally, such collaborative platforms should go beyond compliance issues, aiming instead at all necessary reforms to facilitate international trade and its transport.

International transit and cross-border trade should be facilitated. Maritime connectivity benefits from a larger hinterland for seaports to capture additional cargo from neighbouring countries. Transit can be facilitated in line with international standards and recommendations, including those of the United Nations, the World Customs Organization and the World Trade Organization. Regional and subregional transit regimes may also help and are often more ambitious than the minimum requirements of multilateral regimes.

Trade and its transport

Policy objectives should be clearly defined. Connectivity is not everything. Pressure from shipping lines to invest in seaports to accommodate ever larger ships, especially for trans-shipment operations, may not be worth the extra cost. Without additional volumes, increasing the ship size will reduce the effective capacity of a seaport, as larger yards would be necessary to handle the same total volume. Policy objectives need to be clearly defined. Furthermore, improved maritime connectivity is not an end in itself – it should serve predefined purposes, such as enhancing trade competitiveness and employment.

Transport and trade policies should be realistic. In view of current industry developments in liner shipping, including mergers, global alliances and ever larger gearless ships, it will be difficult and costly for some remote and small markets to maintain frequent and cost-effective liner shipping connections. Trade policies will need to realistically consider what type of goods and services a country can import and export. These may include digital goods and services, or goods that are competitive by air transport in order to complement the goods traded by sea.

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ENDNOTES

1. International shipping services can be divided into two basic groups. In addition to liner shipping services for containerized trade, there are charter or tramp shipping services, used mostly for liquid and dry bulk commodities, such as oil, coal or iron ore. The cargo on a ship belongs to one owner, and the ship is chartered for a point-to-point operation. This type of service is comparable to a taxi service or a charter bus contract. There are no networks of such services, and the concept of connectivity cannot be applied.
2. The liner shipping connectivity index can be downloaded at http://stats.unctad.org/LSCI (accessed 24 September 2017). The calculation is as follows: For each of the five components, a country's value is divided by the maximum value of that component in 2004, and the average of the five components is calculated for each country. This average is then divided by the maximum average for 2004 and multiplied by 100. In this way, the index generates the value 100 for the country with the highest average index of the five components in 2004, which was China. The source of data on container ship schedules in past years until 2015 was *Containerization International*. For 2016 and later years, the data are provided by MDS Transmodal (http://www.mdst.co.uk, accessed 24 September 2017).
3. The bilateral liner shipping connectivity index can be downloaded at http://stats.unctad.org/LSBCI (accessed 24 September 2017). The calculation is as follows: All components are normalized using the standard formula: Normalized_Value = (Raw - Min(Raw)) / (Max(Raw) - Min(Raw)). This formula rather than the Raw/Max(Raw) formula has been chosen mainly because of the existence of minimum values that differ from zero. If all minimum values for all components were zero, both formulas would be equivalent and would generate identical normalized values. The index is computed by taking the simple average of the five normalized components. As a result, the index can only take values between 0 (minimum) and 1 (maximum). As to the first component, its complement to unity (1-Normalized_Value) is taken to respect the correspondence between higher values and stronger connectivity.
4. The statistical correlations presented here are indicative approximations and do not necessarily imply a causality, as higher connectivity may lead to more trade, and vice versa. Furthermore, not all correlations are likely to be linear, as there may be thresholds and combinations of components that will have different impacts together. For example, the level of competition on a route may be more meaningful for a direct connection than for cases involving trans-shipment.