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Title	Appendix B of Port development and competition between the Colombo and Hambantota Ports in Sri Lanka
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Appendix B. Inputs values for model estimations and scenarios

Table B1. Model parameters and estimation methods or source

Parameter	Value	Estimation Methods or Source
VOT	USD 0.5/TEU/hour	Since VOT can be a country-specific value, the VOT value was taken from Shibasaki and Kawasaki (2019) because they considered Sri Lanka as a candidate country for developing a network assignment model for containerized cargo.
α	USD 60/TEU	According to the interviews with haulage companies, the average value of α was USD 54 for 20-ft. and USD 64 for 40-ft. containers. From the SLPA's data, 20-ft. and 40-ft. containers currently represent 60% and 40% of all domestic container boxes, respectively; thus, 20-ft. and 40-ft. containers represent 43% and 57% of all domestic TEUs, respectively. Because the port throughputs were estimated with a logit model, all costs were converted into cost per TEU. To obtain the fixed charge per TEU, the fixed charges for 20-ft. and 40-ft. (i.e., USD 54 and USD 64) were multiplied by their respective shares of total TEUs (43% and 57%). The sum ($54 \times 0.43 + 64 \times 0.57$) was taken as the fixed charge per TEU (α).
β	USD 1/TEU/km	Based on interviews, the average value of *transport cost* per km (β) was USD 0.85/km for 20-ft. and USD 1.12/km for 40-ft. containers. Following a similar calculation to that of α, the transport costs per kilometer (β) per TEU was calculated as USD 1/TEU/km ($0.85 \times 0.43 + 1.12 \times 0.57$).
Detention-free time	12 hours	According to the interviews, companies allow a maximum of 12 hours of detention-free time for exports, starting from the time when an empty container arrives at a shipper's premises for loading. For imports, detention-free time begins when the imported container is taken from the gateway port.
σ	USD 0.85/TEU /hour	Data collected from haulage companies
$T_{(L/U)}$	4 hours	Data collected from haulage companies
θ	0.05	It was difficult to estimate the exact value of θ because this study considered a potential competitive scenario. Therefore, the value of θ was taken from Shibasaki and Kawasaki (2019).
$THC_{(h)}$	USD 155/TEU	Based on the SLPA tariff
$V_{(x)}$	Refer to the total TEUs of each district given for both ports in Fig.3	After forecasting the country's total future container volume using an autoregressive integrated moving average model, this forecasted national volume was disaggregated at the district level as follows. According to SLPA's data, imports represented 70% of the total domestic containerized cargo and were used for both industrial and household purposes. Thus, 50% of imports are assumed to be used for household consumption and distributed proportionately to the districts' average expenditure levels (household-expenditure × district population ÷ household-size). The remaining 50% of imports were distributed proportionately to the districts' industrial output by assuming their usage in industries. However, the total export volume was disaggregated at the district level, proportionate to their industrial outputs. The summation of import and export TEUs of each district was taken as its $V_{(x)}$. We obtained the district-specific industrial and household statistics from the Department of Census and Statistics of Sri Lanka.

Table B2. Container haulage distance and time between gateway ports and 25 districts in Sri Lanka

Districts	Distance (Km)		Time (hours)	
	Colombo	Hambantota	Colombo	Hambantota
Colombo	5.25	221	0.28	5.87
Gampaha	32.55	212	1.00	5.08
Kautara	46.43	197	1.70	4.00
Kandy	114.25	246	3.78	5.74
Matale	144.5	277	4.03	6.18
Nuwara Eliye	164	163	4.98	3.83
Galle	126.13	131	3.29	3.03
Matara	162.75	88.40	3.87	2.14
Hambantota	221	4.7	5.82	0.20
Jaffna	394	531	7.88	10.27
Mannar	300	451	6.29	9.03
Vavuniya	253	390	5.65	8.00
Mullaitvu	318	455	6.80	9.17
Kilinochcni	333	470	7.01	9.37
Battocaloa	307	255	7.24	5.45
Ampara	310	196	7.86	3.96
Trincomalee	254	364	5.89	7.54
Kurunegala	102	247	2.53	5.83
Puttalam	138	335	3.47	7.70
Anuradhapura	199	349	4.37	7.21
Pollonnaruwa	216	278	5.44	5.43
Badulla	226	130	6.22	2.81
Moneragala	246	94	6.42	1.93
Ratnapura	87	137	2.85	2.98
Kegalle	76.7	220	2.51	5.22

Table B3. Input values for scenarios on domestic cargo flow analysis

Scenario	Parameters or Inputs	Colombo	Hambantota
1. Presence of both Colombo and Hambantota ports for container handling	Port charges	USD 155/TEU	USD 155/TEU
	Average transport time	Similar to Table B2	Similar to Table B2
	β	USD 1/TEU/km	USD 1/TEU/km
2. Presence of both Colombo and Hambantota ports with Transport Infrastructure Development for Hambantota	Port charges	USD 155/TEU	USD 155/TEU
	Average transport time	Similar to Table B2	10% lower than Table B2
	β	USD 1/km/ TEU	USD 0.8/km/TEU
3. Presence of both Colombo and Hambantota ports with Reduction of Port Charges at Hambantota	Port charges	USD 155/TEU	USD 139.5/TEU
	Average transport time	Similar to Table B2	Similar to Table B2
	β	USD 1/TEU/km	USD 1/TEU/km
4. Presence of both Colombo and Hambantota ports with both Transport Infrastructure Development and Reduction of Port Charges at Hambantota	Port charges	USD 155/TEU	USD 139.5/TEU
	Average transport time	Similar to Table B2	10% lower than Table B2
	β	USD 1/TEU/km	USD 0.8/km/TEU

Table B4. Significance Score of individual criteria and Performance Score of Colombo

Category	Hub Port-Selection Criteria	SS of Criteria	PS of Colombo
Port charges		4.46	–
Journey cost	Deviation cost	4.46	–
	Feeder link cost	4.69	–
Time cost	Deviation time	4.69	–
	Vessel turnaround time	4.77	–
	Waiting time	4.46	–
	Feeder link time	4.77	–
Port traffic	Captive cargo availability	3.77	1.08
	Frequency of ship visits	3.92	1.39
	Number of services calling at port	3.92	1.08
Location	Location relative to other hub ports	4	1.92
	Hub port accessibility	4.23	1.69
	Connected feeder markets	4.15	2.39
Operation	Port capacity	4.31	1.69
	Berth availability	5	1.31
	Frequency of delays	4.69	0.77
	Records of damages	3.69	1
	Port authority/customs policies/regulations	4	0.85
	Port infrastructure	4.15	1.23
	Port superstructure	3.92	1.23
	IT and advanced technology	4	0.85
	Logistics facilities	4.08	1.31
	Efficiency of navigational services	4.31	1.31
	Efficiency of husbandry services	3	0.85
	Professional employees	4	1.15
	Marketing efforts	3.23	0.85
	Port flexibility on shipping line requests	4.15	0.85
	Financial clearance capability	3.62	0.77
Liner-related	Availability of dedicated/own terminal	3.08	1.08
	Personal contacts	3.23	1
	Special preferences on shipping lines	3.23	0.85
	Availability of feeder services	3.77	1.92
	Opinions/preferences of shippers and forwarders	3.62	1.23
	Position of hub port with shipping line services	3.69	0.77

Source: Kavirathna et al. (2018); port performance for criteria in port charges, journey, and time cost categories were analyzed with quantitative data instead of PS.

Table B5. Journey distance and time between hub ports and feeder ports and deviation from main sea routes

Feeder Ports	Distance (nm)		Time (hours)	
	Colombo	Hambantota	Colombo	Hambantota
Chittagong	1318	1184	86.4	79.2
Kolkata	1238	1109	81.6	72
Haldia	1190	1061	79.2	69.6
Visakhapatnam	867	738	57.6	48
Krishnapatnam	670	541	43.2	36
Chennai	600	471	40.8	31.2
Tuticorin	146	279	9.6	19.2
Cochin	313	432	19.2	28.8
New Mangalore	505	624	33.6	40.8
Nava Shiva	896	1015	60	67.2
Pipavav	1016	1136	67.2	74.4
Mundra	1220	1339	81.6	88.8
Deviation from main route	90	10	5	0.56

Table B6. Input values for scenarios on transshipment cargo flow analysis

Scenario	Parameters or Inputs	Colombo	Hambantota
1.High efficiency at Colombo and equal charges at both ports	Port charges	USD 42/TEU	USD 42/TEU
	Vessel turnaround time	20 hours	24 hours
	Waiting time	2 hours	4 hours
	PS of "Captive cargo availability"	Similar to Table B4	75% lower than Colombo's PS
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	50% lower than Colombo's PS
2. Equal port efficiencies and equal charges at both ports	Port charges	USD 42/TEU	USD 42/TEU
	Vessel turnaround time	20 hours	20 hours
	Waiting time	2 hours	2 hours
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	Similar to Colombo's PS
3. High efficiency at Colombo but lower charges at Hambantota	Port charges	USD 42/TEU	USD 37.8/TEU
	Vessel turnaround time	20 hours	24 hours
	Waiting time	2 hours	4 hours
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	50% lower than Colombo's PS
4. Equal port efficiencies but lower charges at Hambantota	Port charges	USD 42/TEU	USD 37.8/TEU
	Vessel turnaround time	20 hours	20 hours
	Waiting time	2 hours	2 hours
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	Similar to Colombo's PS
5. High efficiency and lower charges at Colombo	Port charges	USD 37.8/TEU	USD 42/TEU
	Vessel turnaround time	20 hours	24 hours
	Waiting time	2 hours	4 hours
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	50% lower than Colombo's PS
6. Equal port efficiencies but lower charges at Colombo	Port charges	USD 37.8/TEU	USD 42/TEU
	Vessel turnaround time	20 hours	20 hours
	Waiting time	2 hours	2 hours
	PS of all criteria except "Captive cargo availability"	Similar to Table B4	Similar to Colombo's PS