
The Liner Shipping Bilateral Connectivity Index

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Why a bilateral LSBCI?

- Fugazza (2015) using a gravity model approach finds that the absence of a direct connection is associated with a drop in exports value varying between 42 and 55 per cent
- Hoffmann et al. (2014) first propose a truly bilateral index of liner shipping connectivity which is an extension of UNCTAD's already existing country-level Liner Shipping Connectivity Index (LSCI) based on a proper bilateralization transformation
- The LSBCI presented here builds on these two contributions



Data

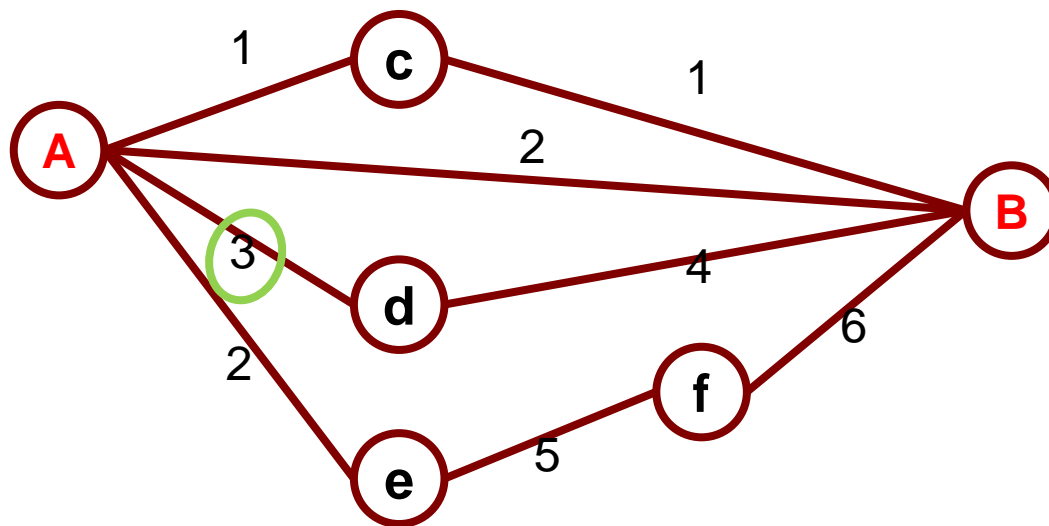
- Results are based on a sample of 138 coastal countries (9453 country pairs) whose connectivity has been informed (*Lloyds List Intelligence data on fleet deployment* (www.ci-online.co.uk)) during the period running from 2006 to the current year
- The year 2007 is not reported due to the absence of observations
- Possibility to include additional coastal countries but also landlocked countries
- The LSBCI is computed once each year (<http://stats.unctad.org/lbci>)



Components and computations

- Absolute** {
 - 1) The number of transshipments required to get from country k to country j
 - 2) The number of common direct connections (connection options with 1 transshipment)
- Relative** {
 - 3) The geometric mean of the number of direct connections (reflects centrality/remoteness)
- Deepness** {
 - 4) The level of competition on services that connect country pairs (i.e. number of companies on the thinnest route)
 - 5) The size of the largest ships on the weakest route (reflects infrastructure)

- Competition: number of companies on the thinnest route



Components and computations

- In order to establish a unit free index all components are normalized using the standard formula:

$$\text{Raw-Min(Raw)} / (\text{Max(Raw)} - \text{Min(Raw)})$$

- We opted for this formula rather than the $\text{Raw}/\text{Max(Raw)}$ formula essentially because of the existence of minimum values which differ from zero: if all minimum values were zero both formulas generate identical normalized values
- The LSBCI is computed by taking the simple average of the five normalized components: **the LSBCI can only take values between 0 and 1**
- Index values comparable across countries and years: maximum and minimum values are fixed



Stylized facts: components

Number of Transhipments (shares)	2006	2008	2010	2012	2014	2015
0	20.05	21.08	20.82	20.05	19.6	18.18
1	66.98	67.25	64.43	64.49	64.23	63.36
2	12.81	11.66	14.68	15.4	16.09	18.34
3	0.16	0.01	0.06	0.06	0.07	0.12

Direct Connections (Common)	2006	2008	2010	2012	2014	2015
Median	5	5	5	5	5	7
Mean	8	9	9	8	8	11
Standard deviation	10	11	10	10	10	13
Maximum	92	95	90	85	81	94

Direct Connections (Geom.Mean)	2006	2008	2010	2012	2014	2015
Median	21	22	22	23	22	29
Mean	24	25	25	25	25	32
Standard Deviation	15	15	15	15	15	17
Maximum	102	105	99	101	102	111

Stylized facts: components

Carriers (Min-Max)	2006	2008	2010	2012	2014	2015
p50	2	2	2	3	4	4
Mean	4	4	3	5	5	5
Sd	4	4	4	5	5	5
Max	82	82	58	72	63	61

Ship_Size (Max-Min)	2006	2008	2010	2012	2014	2015
p50	1410	1438	1638	1510	1691	1705
mean	1807	1964	2267	2505	2688	2863
sd	1607	1749	2180	2621	2894	3132
Max	9742	12508	14770	15550	18270	19224

Source: Authors' Calculations



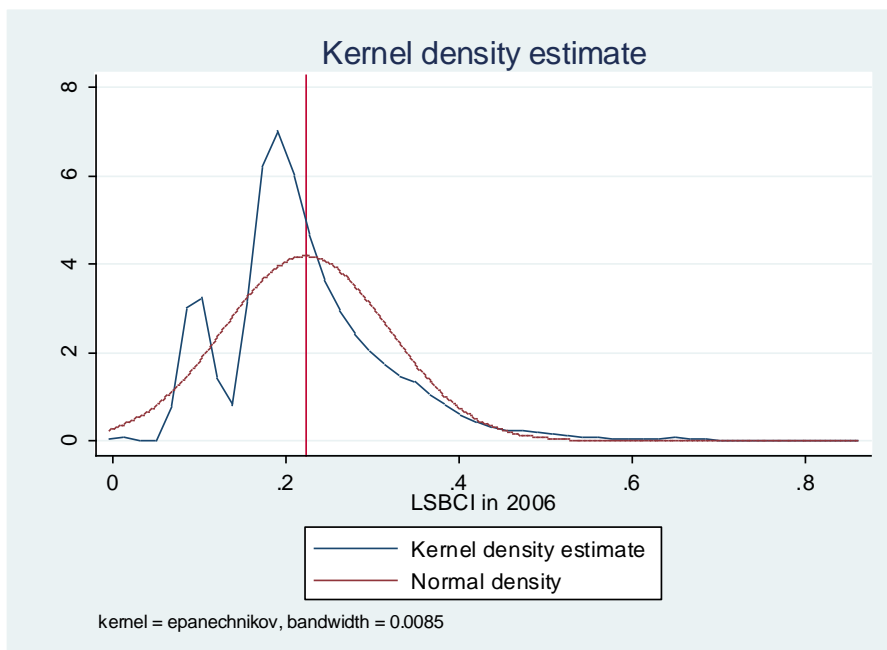
Stylized facts: LSBCI, overall

Year	Mean	Median	Standard Deviation
2006	0.223	0.206	0.095
2008	0.227	0.209	0.098
2009	0.223	0.206	0.100
2010	0.227	0.208	0.101
2011	0.227	0.207	0.102
2012	0.233	0.211	0.106
2013	0.231	0.208	0.105
2014	0.233	0.211	0.108
2015	0.256	0.230	0.120

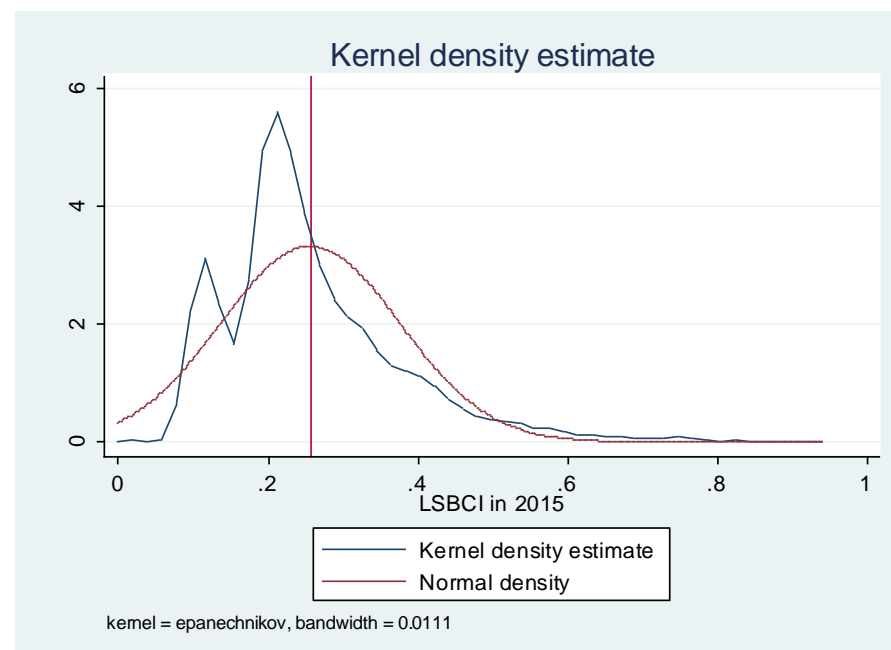
Source: Authors' Calculations



Stylized facts: LSBCI, overall



2006



2015



Stylized facts: Top 10 country pairs

year		LSBCI	year		LSBCI	year		LSBCI
	NLD GBR	0.930		HKG CHN	0.828		GBR BEL	0.852
	BEL GBR	0.914		GBR BEL	0.821		GBR NLD	0.849
	NLD DEU	0.912		NLD GBR	0.818		DEU BEL	0.837
	BEL NLD	0.911		BEL NLD	0.807		GBR DEU	0.823
2015	BEL DEU	0.908	2010	BEL DEU	0.799	2006	BEL NLD	0.822
	GBR DEU	0.897		GBR DEU	0.797		NLD DEU	0.804
	HKG CHN	0.880		DEU NLD	0.790		BEL FRA	0.784
	KOR CHN	0.870		CHN SGP	0.785		FRA GBR	0.778
	SGP MYS	0.859		GBR FRA	0.782		HKG CHN	0.763
	FRA GBR	0.859		SGP MYS	0.779		FRA ESP	0.748



Stylized facts: Bottom 10 country pairs

year		LSBCI	year		LSBCI	year		LSBCI			
	COD	COK	0.023		COK	GEO	0.013	PLW	MSR	0.010	
	COK	COM	0.022		GEO	COK	0.013	MDV	MSR	0.010	
	LVA	COK	0.021		COD	NRU	0.013	IRQ	MSR	0.010	
	GEO	COK	0.020		NRU	COD	0.013	MSR	KWT	0.010	
2015	COK	SLE	0.020	2010	COK	QAT	0.010	2006	BHR	MSR	0.009
	ALB	COK	0.019		COK	SOM	0.010		MSR	COK	0.009
	COD	NRU	0.015		SOM	COK	0.010		MSR	BHR	0.009
	COK	SOM	0.015		IRQ	NRU	0.010		NRU	COD	0.007
	COK	MNE	0.013		NRU	IRQ	0.010		COD	NRU	0.007
	ERI	COK	0.011		COK	ALB	0.008		NRU	MSR	0.006



Stylized facts: Top 25 countries (average scores)

2015

Exporter	LSBCI
CHN	0.417
USA	0.414
GBR	0.411
HKG	0.409
FRA	0.407
DEU	0.406
NLD	0.406
SGP	0.404
BEL	0.403
ESP	0.402
MYS	0.402
KOR	0.397
ITA	0.391
MAR	0.370
TWN	0.370
ARE	0.367
JPN	0.355
EGY	0.355
PAN	0.352
SAU	0.352
LKA	0.350
IND	0.349
ZAF	0.346
CAN	0.343
PRT	0.343

2010

Exporter	LSBCI
CHN	0.373
GBR	0.372
HKG	0.368
FRA	0.366
BEL	0.364
NLD	0.358
DEU	0.356
USA	0.354
SGP	0.353
ESP	0.350
KOR	0.348
MYS	0.347
ITA	0.344
TWN	0.326
JPN	0.320
ARE	0.315
EGY	0.311
SAU	0.308
IND	0.306
PAN	0.305
LKA	0.301
MAR	0.301
ZAF	0.298
PRT	0.298
MLT	0.294

2006

Exporter	LSBCI
GBR	0.385
BEL	0.375
DEU	0.372
FRA	0.372
NLD	0.366
USA	0.363
HKG	0.360
ESP	0.360
CHN	0.358
ITA	0.356
SGP	0.344
MYS	0.339
KOR	0.333
JPN	0.322
EGY	0.313
ARE	0.308
SAU	0.308
CAN	0.305
IND	0.304
LKA	0.303
BRA	0.299
ZAF	0.293
MEX	0.292
JAM	0.292
MLT	0.287

Stylized Facts: Components for Ecuador, 2006

	Sea_Dist	Tans	DIRECT	DIR_Mea	Ship	carriers	I_Trans	I_DIRECT	I_DIR_M	I_carriers	I_Ship
USA	5902.32	0.00	28.00	52.21	2775.00	9.00	1.00	0.29	0.49	0.11	0.15
BEL	10460.10	0.00	27.00	53.58	2202.00	5.00	1.00	0.28	0.50	0.06	0.12
HKG	17540.29	0.00	24.00	49.06	3091.00	6.00	1.00	0.25	0.46	0.07	0.17
FRA	10102.66	0.00	27.00	53.31	2202.00	4.00	1.00	0.28	0.50	0.05	0.12
CHN	16382.79	0.00	25.00	47.86	3091.00	6.00	1.00	0.26	0.45	0.07	0.17
DEU	10943.47	0.00	26.00	52.49	2202.00	4.00	1.00	0.27	0.49	0.05	0.12
COL	1079.72	0.00	27.00	34.06	2556.00	15.00	1.00	0.28	0.32	0.18	0.14
PER	1303.81	0.00	27.00	30.46	3091.00	15.00	1.00	0.28	0.28	0.18	0.17
KOR	15499.39	0.00	25.00	44.08	3091.00	6.00	1.00	0.26	0.41	0.07	0.17
GBR	10328.60	0.00	26.00	55.44	1740.00	2.00	1.00	0.27	0.52	0.02	0.10
NLD	10465.65	0.00	25.00	51.09	2202.00	4.00	1.00	0.26	0.48	0.05	0.12
ESP	9587.80	0.00	27.00	51.37	1830.00	3.00	1.00	0.28	0.48	0.04	0.10
ITA	11471.29	0.00	26.00	50.23	1740.00	2.00	1.00	0.27	0.47	0.02	0.10
JPN	14769.70	0.00	24.00	42.40	2794.00	4.00	1.00	0.25	0.40	0.05	0.15
MEX	3718.82	0.00	27.00	37.70	2556.00	6.00	1.00	0.28	0.35	0.07	0.14
CHL	3715.11	0.00	26.00	29.98	2556.00	12.00	1.00	0.27	0.28	0.15	0.14
PAN	1581.61	0.00	25.00	34.06	2470.00	10.00	1.00	0.26	0.32	0.12	0.14
JAM	2590.95	0.00	26.00	37.31	2202.00	2.00	1.00	0.27	0.35	0.02	0.12
GTM	3092.84	0.00	22.00	33.63	2764.00	2.00	1.00	0.23	0.31	0.02	0.15
VEN	3035.43	0.00	22.00	34.06	1830.00	1.00	1.00	0.23	0.32	0.01	0.10
DOM	3029.87	0.00	22.00	32.76	1830.00	2.00	1.00	0.23	0.30	0.02	0.10
ARG	8793.30	0.00	21.00	33.20	1378.00	1.00	1.00	0.22	0.31	0.01	0.08
CRI	1913.12	0.00	23.00	29.98	910.00	1.00	1.00	0.24	0.28	0.01	0.05
SGP	20101.60	1.00	19.00	45.06	3091.00	9.00	0.67	0.20	0.42	0.11	0.17
BRA	9483.51	1.00	25.00	38.46	3091.00	9.00	0.67	0.26	0.36	0.11	0.17

Stylized Facts: Components for Ecuador, 2015

	Sea_Dist	Tans	DIRECT	DIR_Mea	Ship	carriers	I_Trans	I_DIRECT	I_DIR_M	I_carriers	I_Ship
USA	5902.32	0.00	28.00	56.92	4256.00	10.00	1.00	0.29	0.54	0.12	0.23
COL	1079.72	0.00	28.00	39.12	5652.00	15.00	1.00	0.29	0.37	0.18	0.31
CHN	16382.79	0.00	26.00	51.67	5652.00	4.00	1.00	0.27	0.49	0.05	0.31
BEL	10460.10	0.00	26.00	51.38	4256.00	8.00	1.00	0.27	0.48	0.10	0.23
NLD	10465.65	0.00	25.00	51.38	4256.00	8.00	1.00	0.26	0.48	0.10	0.23
FRA	10102.66	0.00	25.00	52.82	4256.00	6.00	1.00	0.26	0.50	0.07	0.23
PAN	1581.61	0.00	29.00	40.62	4256.00	12.00	1.00	0.31	0.38	0.15	0.23
HKG	17540.29	0.00	24.00	47.75	5652.00	4.00	1.00	0.25	0.45	0.05	0.31
PER	1303.81	0.00	24.00	28.46	5652.00	19.00	1.00	0.25	0.26	0.23	0.31
MEX	3718.82	0.00	25.00	35.92	5652.00	12.00	1.00	0.26	0.33	0.15	0.31
DEU	10943.47	0.00	24.00	49.90	4256.00	8.00	1.00	0.25	0.47	0.10	0.23
ESP	9587.80	0.00	26.00	53.10	3194.00	4.00	1.00	0.27	0.50	0.05	0.17
GTM	3092.84	0.00	22.00	30.98	5652.00	9.00	1.00	0.23	0.29	0.11	0.31
GBR	10352.68	1.00	25.00	53.67	5652.00	12.00	0.67	0.26	0.50	0.15	0.31
ITA	11471.29	0.00	27.00	51.09	1730.00	2.00	1.00	0.28	0.48	0.02	0.09
DOM	3029.87	0.00	27.00	38.73	3194.00	2.00	1.00	0.28	0.36	0.02	0.17
KOR	15536.43	1.00	25.00	47.43	5652.00	13.00	0.67	0.26	0.44	0.16	0.31
CHL	3715.11	0.00	23.00	27.93	3739.00	10.00	1.00	0.24	0.26	0.12	0.20
MYS	20379.41	1.00	24.00	49.60	5652.00	10.00	0.67	0.25	0.47	0.12	0.31
RUS	13730.73	0.00	21.00	38.34	3194.00	2.00	1.00	0.22	0.36	0.02	0.17
TUR	12580.64	0.00	19.00	39.87	3194.00	2.00	1.00	0.20	0.37	0.02	0.17
SGP	20101.60	1.00	18.00	48.68	5652.00	10.00	0.67	0.19	0.46	0.12	0.31
BRA	9789.67	0.00	19.00	33.76	3430.00	3.00	1.00	0.20	0.31	0.04	0.19
EGY	12044.63	1.00	22.00	42.78	5652.00	10.00	0.67	0.23	0.40	0.12	0.31
MAR	8804.59	1.00	22.00	44.50	5652.00	8.00	0.67	0.23	0.42	0.10	0.31