

Port container drayage: disruptions and interventions in urban context

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Overview

- Port container drayage may be defined as the transportation by motor truck of containers to and from marine terminals over relatively short distances, typically within the metropolitan region hosting both the port facility and the inland point of origin/destination.
- Port drayage trucking as a critical supply chain asset in contemporary container ports due to ship size, terminal efficiency and spatially distributed destinations – hence, a site of conflict, disruptions, interventions and experimentation with governance models.
- We ask: what are the urban contexts in which port container drayage disruptions have occurred, and what is the range and type of port container trucking industry interventions that seek to reduce negative externalities and related use conflicts; how are these interventions and practices organized into overarching governance models, and what is the relationship between the urban context and these governance models?

DISRUPTION



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Gateway Geofences

INTERVENTION



Data characteristics

Disruptions and interventions

- 1,190 “reports”
- Description and rationale
- 107 Ports (divided into main port ranges)
- Stakeholders
- Intervention approach, type
- Dates (start, end)

Context variables

- TEU throughput
- Urban agglomeration population
- GDP and population national
- Share of primary-secondary-service employment in national economy
- Eight, 5-year time periods (1980-2015)
- Locus of control (municipal, state, nation and/or private)

Selected ports

Region	Ports (107)	
Australia-Pacific	5	Brisbane, Melbourne, Sydney, Auckland, Tauranga
China	12	Shanghai, Shenzhen, Ningbo, Hong Kong, Qingdao, Guangzhou, Tianjin, Dalian, Xiamen, Yingkou, Suzhou, Lianyungun
Other Asia	24	Singapore, Busan, Jebel Ali, Sharjah, Port Klang, Kaohsiung, Tanjung Pelepas, Tanjung Perak, Tanjung Priok , Laem Chabang, Ho Chi Minh City, Haiphong, Jeddah, Mumbai, Karachi, Khor Fakkan, Keihin (Tokyo, Yokohama, Kawasaki), Manila, Istanbul, Hanshin (Kobe, Osaka, Sakai-Sembuko, Amafasaki-Nishinomiya-Ashiya), Nagoya, Incheon, Colombo, Keelung
Europe	23	Rotterdam, Antwerp, Hamburg, Bremen, Valencia, Algeciras, Felixstowe, Gioai Tauro, Piraeus, Le Havre, Gothenborg, Marsaxlokk, Genoa, Southampton, Barcelona, Gdansk, Liverpool, Dunkirk, Wilhelmshaven, DPW London, Amsterdam, Marseille, Vado Liguiria
Africa	11	Port Said, Tangier-Med, Djibouti, Durban, Mombasa, Dar Es Salaam, Lagos, Abidjan, Dakar, Luanda, Cape Town
North America	22 (24)	Los Angeles/Long Beach, New York and New Jersey, Savannah, Seattle/Tacoma, Vancouver, Prince Rupert, Montreal, Halifax, Norfolk, Jacksonville, Miami, Houston, Manzanillo, Veracruz, Oakland, Charleston, Lazaro Cardenas, Port Everglades, Baltimore, Altamira, New Orleans, San Juan
South America	10	Santos, Buenos Aires, Montevideo, Valparaiso, Cartagena, Callao, Panama/Balboa, Panama/Colon, Freeport, Kingston

Stakeholder (leads): drivers, port authorities and governments

STAKEHOLDER LEAD	Disruption	Intervention
Unknown	1.8%	0.1%
Civil Society	5.2%	0.1%
Drivers or Union	60.6%	0.7%
Government	7.4%	35.9%
Industry-Landside	10.5%	8.0%
Industry-Terminal	1.2%	11.5%
Industry-Water	0.0%	2.9%
Other	1.5%	1.3%
Port Authority	11.7%	39.6%
TOTAL	100.0%	100.0%

Intervention approach: a small preference for infrastructure

Technological	A technology meant to affect port-related trucking	16%
Regulatory	A regulation meant to affect port-related trucking	25%
Infrastructure-based	Infrastructure that is developed to affect port-related trucking	34%
Operational	Changes to the operations of how port-related trucking is conducted	25%

Planning	Interventions that facilitate information or idea exchange, which may attempt to address problems faced by stakeholders and work towards solutions	<ul style="list-style-type: none"> Planning - Association Planning - Comprehensive Strategy Planning - Multi-Stakeholder Forum (Term-Limited) Planning - Multi-Stakeholder Forum (Semi-Permanent) Planning - Multi-Stakeholder Outreach (Semi-Permanent) Planning - Multi-Stakeholder Outreach (Term-Limited) Planning - Report Planning - Whistleblower Service Planning - Workshop (Term-Limited) 	6.9%
Pricing	Changes to either the pricing of services between stakeholders or pricing that is designed to affect behavior	<ul style="list-style-type: none"> Pricing - Fees Pricing - Government Purchase Pricing - Grants Pricing - Insurance Pricing - Licensing Pricing - Loans Pricing - Penalty Pricing - Rates Pricing - Toll Pricing - Wages 	6.3%
Mode and System	Physical interventions that are meant to 'improve' the supply chain in some aspect for stakeholders	<ul style="list-style-type: none"> Mode and System - Automation Mode and System - Backloads Mode and System - Blockades Mode and System - Chassis Pool Mode and System - Communication Mode and System - Container Interchange Mode and System - Emissions Reduction Mode and System - Weighbridge 	18.9%
Land Use	Changes to land use, either current or planned	<ul style="list-style-type: none"> Land Use - Container Depot Land Use - Driver Facilities Land Use - Fueling Site Land Use - Transfer Facility Land Use - Truck Parking 	5.7%
Hinterland Routes	Changes to how and where freight is transported between the terminal gate and the hinterland	<ul style="list-style-type: none"> Hinterland Routes - Bypass Hinterland Routes - Grade Separation Hinterland Routes - Inland Terminal Hinterland Routes - On-Dock Rail Hinterland Routes - Rail Route Hinterland Routes - Road Enhancement Hinterland Routes - Short Sea Shipping 	32.7%
Terminal Gates	Changes to the terminal gates	<ul style="list-style-type: none"> Terminal Gates - Automated Gate Terminal Gates - Communication Terminal Gates - Express Lane Terminal Gates - Extended Hours Terminal Gates - Gate Expansion Terminal Gates - Movement Terminal Gates - Reservation Terminal Gates - Security Terminal Gates - Staging 	16.5%
Regulation	Changes to port-related trucking regulations or how the system is regulated	<ul style="list-style-type: none"> Regulation - Area Regulation - Comprehensive Regulation - Customs Regulation - Drivers Regulation - Exemption Regulation - Size Regulation - Time Regulation - Traffic Regulation - Vehicle Age Regulation - Weight 	13.0%

Type of intervention:

Lots of:
Hinterland,
Mode & System,
and Gates....

Not so much:
Planning,
Land use, and
Pricing

Disruptions (325) & Interventions (865)

- Earliest:

- 1979 Southampton, driver strike
- 1987 NY&NJ, Motor Truck Association avoids tunnel delays

- Recent:

- 2018 Dar es Salem, truck owners seek port space
- 2018 Lagos, truck drivers' conditions

- Mean – 2008.5

- Mode - 2017

- Earliest:

- 1965 Seattle, Port Authority applies Standard Carrier Alpha Code
- 1970 Felixstowe, Port Authority rail bypass

- Recent:

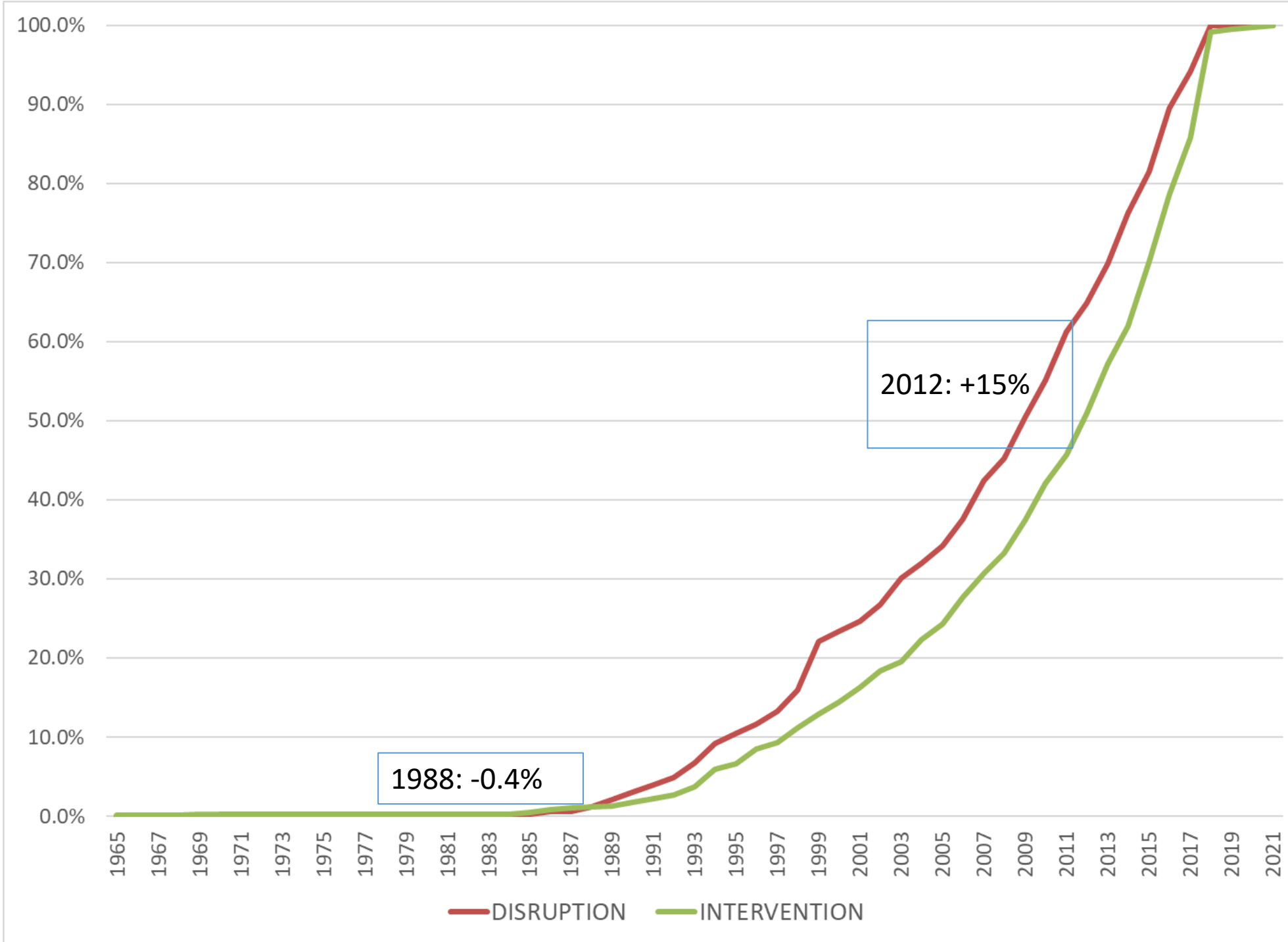
- 2018 Mumbai, Port Authority short sea shipping
- 2018 Sharjah, Government, 9-lane bridge

- Mean – 2010.9

- Mode - 2019

Timeline –
cumulative
share of
disruptions
(325) and
interventions
(865)

Interventions
at first, but
disruptions
lead after
1988



Some port ranges more active: ECNA, WCNA & NEW but also Africa, China, W Asia...

		Disruption	Intervention
Range	Africa	14.2%	8.0%
	Australasia	4.6%	6.0%
	Caribbean	1.8%	1.0%
	China	4.0%	5.6%
	East Asia	4.9%	1.3%
	ECLA	1.8%	1.5%
	ECNA	19.1%	20.6%
	Mediterranean	4.3%	4.2%
	North-Western Europe	10.5%	11.6%
	South-East Asia	14.2%	14.3%
	Western Asia	4.6%	6.0%
	WCLA	1.2%	0.7%
	WCNA	14.8%	19.2%
Total		100.0%	100.0%

Port by port range: First and mean number of disruptions and interventions

	Disruption		Intervention		Notable
	First	Mean #	First	Mean #	
AFR	1994	5.75	2007	8.75	Durban
AUS	1997	3.00	1999	10.40	Brisbane
CAR	1989	1.50	1989	2.25	
CHI	1998	1.00	1987	3.77	
EAS	1995	3.20	1996	2.20	
ECLA	1999	3.00	1993	6.50	
ECNA	1987	4.13	1990	12.00	NY&NJ
MED	1989	1.17	1986	3.08	
NWE	1979	2.43	1970	7.21	Felixstowe
SEA	1992	3.54	1992	9.62	Ho Chi Minh City
WAS	2008	2.50	2002	8.67	Jebel Ali
WCLA	1996	1.33	2016	2.00	
WCNA	1994	6.86	1965	24.00	All the bigs ones...
Total	1979	3.04	1965	8.16	

Disruptions: more likely to occur with larger GDP, and with state/provincial control

Variables in the Equation

		B	S.E.	Wald	Sig.	Exp(B)
Step 1 ^a	TEU_5YGROWTH	.011	.105	.010	.919	1.011
	AgglPopulation_5YGROWTH	-2.204	1.818	1.469	.225	.110
	Log_Pop_5YAVG	-.149	.158	.888	.346	.862
	Log_GDP_5YAVG	.532	.168	10.002	.002	1.702
	NorthAmerica	.184	.472	.153	.696	1.203
	Range=CHI	-.774	.767	1.019	.313	.461
	LatinAmerica	-.097	.724	.018	.893	.907
	EastAsia	.522	.447	1.360	.244	1.685
	Range=AFR	1.376	.648	4.510	.034	3.958
	LocusofControlMunicipal	-.954	.413	5.345	.021	.385
	LocusofcontrolNational	-.553	.418	1.748	.186	.575
	LocusofControlPrivate	-1.761	.653	7.266	.007	.172
	Constant	-12.356	3.425	13.014	.000	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	320.057 ^a	.163	.256

Interventions: more likely to occur with disruptions, and in ports with large TEU and GDP

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	358.670 ^a	.332	.485

Variables in the Equation		B	S.E.	Wald	Sig.	Exp(B)
Step 1 ^a	Log_TEU_5YAVG	.599	.141	18.076	.000	1.820
	Log_GDP_5YAVG	.671	.183	13.419	.000	1.956
	Log_Pop_5YAVG	-.589	.176	11.192	.001	.555
	Log_AgPop_5YAVG	-.381	.156	5.995	.014	.683
	ThreeOrMoreDisrupt	3.346	1.206	7.693	.006	28.387
	Binned_Disruption_Dummy	1.628	.329	24.492	.000	5.091
	NorthAmerica	.292	.443	.434	.510	1.339
	Range=CHI	.425	.646	.432	.511	1.529
	LatinAmerica	1.023	.614	2.772	.096	2.780
	EastAsia	.166	.491	.114	.736	1.180
	Range=AFR	.731	.800	.836	.361	2.078
	LocusofControlMunicipal	.194	.380	.259	.611	1.214
	LocusofcontrolNational	.015	.411	.001	.971	1.015
	LocusofControlPrivate	.393	.523	.564	.452	1.481
	Constant	-14.863	2.928	25.768	.000	.000

Conclusion

- Preliminary findings indicate that port drayage interventions are often closely related to disruptions, that they have diffused more rapidly in wealthy urban contexts, and that they involve a range of stakeholders reaching well beyond the port-terminal-drayage industries.
- These findings speak to the need for new governance arrangements that involve collaboration between port and urban authorities. In this regard, some urban contexts appear better positioned to address the externalities of port container drayage than others.