



COMMENTARY

# Maritime container terminal infrastructure, network corporatization, and global terminal operators: Implications for international business policy

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**Abstract**

Maritime shipping lines and global terminal operators have benefited from economies of scale to expand geographically and functionally their infrastructure, leading to a corporatized network. Terminal operators are key asset managers seeking value creation by expanding the global maritime container terminal infrastructure network. While corporatization has systematically ensured that terminal capacity was created to accommodate the rise in global trade volumes, the network hit its boundaries when confronted with COVID-19 induced global supply chain disruptions. This paper provides a better understanding of the importance of infrastructure and observed corporatization as a framework for explaining economic processes, notably when transport infrastructures are extensive and capital-intensive. The structure of the global container shipping network is analyzed to unveil the realities of liner service networks operated by shipping lines, and the market structure and consolidation in container shipping and terminal operations. The discussion on the corporatization of the global maritime infrastructure network for container handling is embedded in international business literature. This study also extracts the main implications of the current structure and governance of the global maritime infrastructure network for international business policy, with a particular focus on the current market structure and network resilience.

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## INTRODUCTION

Containerization began in 1956 when the American entrepreneur Malcom McLean launched the first container ship. A decade later, in 1966, transatlantic container services marked the entry of the container as an infrastructure system enabling international trade (Levinson, 2016). In the early years of containerization, shipping companies, terminal operators, and freight forwarders were reluctant to transition to a new transportation system. It required

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significant capital investments in infrastructure and assets such as ships, terminals, and inland transport. Once the advantages of the container as a multimodal load unit became more apparent in the 1980s, containerization diffused rapidly across maritime and inland freight transport systems (Rodrigue & Notteboom, 2009).

The emerging worldwide container shipping network reshaped supply chains, supporting the globalization of production and consumption, transforming the global economic geography (Bernhofen et al., 2016; Levinson, 2016) and the related distribution systems (Fransoo & Lee, 2013). Global container port throughput experienced an ongoing growth from 36 million TEU<sup>1</sup> in 1980 to 237 million TEU in 2000. It accelerated from 545 million TEU in 2010 to about 849 million TEU in 2021 (UNCTAD, 2021). Containerization placed substantial pressure to introduce and expand its supporting modes, infrastructure, and superstructure. The outcome was container fleet expansion, vessel upscaling, with ships of up to 24,000 TEU deployed on the Europe–Far East trade route, geographic expansion, the intensification of container shipping services, and massive investments in container terminals at strategic locations on trade routes. The footprint of container terminals increased dramatically, with some of the newest facilities in large hub ports having an annual handling capacity of over 5 million TEU. For a single large project, the total investment cost related to the infrastructure (quay walls, land reclamation, and dredging works, preparation of terminal surface) and equipment (ship-to-shore cranes, yard equipment) can reach several billions of dollars.

To facilitate the emergence and expansion of a global container terminal network, the governance and organizational characteristics of the container terminal industry underwent a significant transformation, mainly through the corporatization of maritime container terminal infrastructure and the associated network. Corporatization, which refers to reorganizing a government-owned entity into a commercial entity, has been substantially investigated in the economic and management literature. Sectors such as public utilities (Newbery, 1997), railways (Esposito et al., 2020; Grushevskaya et al., 2016), and airlines (Gillen, 2011; Pagliari & Graham, 2019) have received particular attention.

Corporatization has been ongoing in maritime shipping, particularly in the port terminal sector. While maritime shipping lines are mainly private

entities, most ports were publicly owned and operated until reforms were set in the 1990s (Brooks et al., 2017). Ports became more market-oriented as inter-port competition intensified in line with the emergence of contestable hinterlands and more complex supply chains. Corporatization brings a greater involvement of the private sector, which is assumed to improve port competitiveness, higher productivity, and lower costs. However, differences in outcomes have been observed among countries (see Brooks & Cullinane, 2006; Brooks et al., 2017 for an extensive multi-country analysis of the outcomes of port reform and devolution). Since ports are merely nodes in global supply chains, the real benefits of port productivity gains and lower costs accrue to the producers and the consumers of the products shipped through the ports because they enjoy the benefits of low-cost trade.

In hindsight, corporatization has resulted in the emergence of a global maritime container terminal network with unique characteristics in terms of its geography, structure, governance settings, assets, and commercial implications. While corporatization has systematically ensured that terminal capacity was created to accommodate the rise in global trade volumes (Farrell, 2012; Villa, 2017), the COVID-19-induced global supply chain crisis exposed the network's limitations when confronted with major shocks (Notteboom et al., 2021). At the onset of the pandemic, the combination of supply shocks and demand shocks caused by lockdowns across the world initially resulted in lower trade and port volumes. However, the situation started to reverse rapidly in the summer of 2020, fueled by a shift in consumer spending from services to products, strong growth in e-commerce, and a rather unexpected fast economic recovery supported by extensive government stimulus packages. Strong demand growth (particularly for durable goods such as office equipment, electronics, and furniture) and large-scale restocking by importers and retailers began to pressure supply chains. At the same time, the supply side could not react effectively due to vessel capacity and equipment shortages (empty containers, chassis, rail wagons, etc.) and availability issues concerning dock workers, truckers, and the related logistics workforce. The temporary closures of factories, logistics facilities and terminals in China and elsewhere, and the lack of labor due to quarantines, lockdowns, and home isolation further aggravated the situation. The combined effects of these supply–demand



imbalances gave rise to elevated congestion levels in key ports and terminals worldwide, mainly along the US West Coast, China, and northwest Europe. The spike in containerized trade initiated in the summer of 2020 even intensified throughout 2021 and 2022. As the supply chain crisis gained momentum, cargo owners had to accept historically high freight rates, despite rising container dwell times in ports, historically low schedule reliability in liner services, and severe supply chain delays.

COVID-19 thus presented a major test for the resilience of the global container shipping network, and invites market players and policymakers to assess whether corrective actions are needed to the governance and organizational characteristics of the container terminal industry. With this in mind, the objective of this paper is twofold.

First, this paper explores how corporatization unfolds in this particular setting. The *structure of the global container shipping network* is analyzed to unveil the realities of liner service networks operated by shipping lines, and the market structure and consolidation in container shipping and terminal operations. We also identify key *spatial and functional characteristics of the global maritime infrastructure network*, with the identification of choke-points, transshipment markets, and multi-port gateway regions, and a global view of the container terminal network, also in light of the supply chain crisis induced by the COVID-19 pandemic. Furthermore, the paper sheds light on the *corporatization of the global maritime infrastructure network for container handling*, with a discussion embedded in international business literature on global terminal operators, and the drivers, modalities, and developments behind their emergence and growth.

Second, this study extracts the main implications of the current structure and governance of the global maritime infrastructure network for international business policy, with a particular focus on the current market structure and network resilience. International business policy refers to “change intentionally instigated by government to have an action upon the decision-making and behavior of firms within the international business domain” (Clegg, 2019; Lundan, 2018). In particular, we discuss the contours and areas for international business policy initiatives in relation to the observed internationalization and corporatization in the terminal operating industry.

## THE STRUCTURE OF GLOBAL CONTAINER SHIPPING NETWORKS

The global shipping network expresses how infrastructures are coordinated with trade and commercial processes. Capacity must meet demand as shortages result in missed opportunities, and surpluses involve lower returns in capital-intensive investments. The two major components of the global shipping networks are the routes on which are allocated shipping assets and the container terminals that are nodes. The majority of container shipping networks are articulated along liner services, which allocate a number of ship assets along a loop involving a port-of-call sequence. For example, a typically scheduled liner service between northern Europe and the Far East uses a fleet of 11 to 12 ultra-large container vessels with a unit capacity of 16,000 to 24,000 TEU to provide weekly calls at, on average, four European ports and six Asian ports strategically located along the route.

The network configuration involves a complex decision-making process where each shipping line brings its managerial expertise, taking into account trade flows, major customers, and the efficiency of terminal operations. Shipping lines design liner services and networks that optimize vessel utilization and exploit economies of scale in ship size. The core objective is to maximize the ship load factor to use assets effectively. However, shipping lines also have to consider customer requirements regarding preferred ports of loading and discharge, freight rates, transit times, and schedule reliability.

Corporatization has been associated with a scale effect that can be observed within organizations and their assets. The container shipping business has experienced several waves of mergers and acquisitions that began in the 1990s before peaking at 18 in 2006. The most recent wave of carrier consolidation occurred in the period 2014 to 2018, with the most notable mergers including the mergers between China Shipping and Cosco, between NYK Line, MOL, and K-Line to form a Japanese container carrier ONE (Ocean Network Express), the takeover of Hamburg-Sud by Maersk Line, and the acquisition of OOCL by COSCO (Crotti et al., 2020; Notteboom, 2021).

As a result, the largest container shipping lines are getting bigger, leading to a concentration along a two-tier system. The first is composed of a core of nine major shipping lines with global coverage (in 2010, this tier still included about 20 carriers) and a

second tier of regional and specialized carriers, often servicing feeder networks (Figure 1, left side). Since the mid-1990s, first-tier carriers started to engage in joint fleet capacity management on a multi-trade basis through alliance structures (Notteboom et al., 2017; Slack et al., 2002). As of 2021, three alliances dominated the shipping market with about 80% of the total container shipping capacity: 2M (Maersk Line and MSC), Ocean Alliance (COSCO, CMA CGM, and Evergreen), and THE Alliance (ONE, Yang Ming, Hapag-Lloyd, and HMM).

The observed scale effect in the container shipping industry could not have been achieved without a supporting organizational structure, the capability to tap capital markets, and an extensive network of ports of call to generate enough cargo. The corporatization of port terminals has facilitated this scale effect to support a high-capacity transnational shipping and terminal operating network. Similar to the container shipping lines, consolidation has taken place for container terminal operators. A group of eight first-tier operating at the global (multi-region) level and the remaining have a portfolio with a more substantial regional orientation (Figure 1, right side). While both the liner shipping and terminal operating industries have a high concentration level, as expressed by their Gini coefficients, the terminal operating sector has a significantly higher concentration level (Gini of 0.37 versus 0.50).

### NAVIGATION CHOKEPOINTS, GATEWAYS, AND TRANSSHIPMENT HUBS

Compared to air and rail transport, which rely on point-to-point services using predefined paths, container shipping has, in principle, more degrees of freedom in vessel routing with restrictions imposed by the topology and geography of seas, coastlines, chokepoints such as interoceanic passages (e.g., Straits of Malacca, Straits of Gibraltar), and artificial canals (e.g., Panama Canal, Suez Canal), and the nautical accessibility profile of seaports. Investment decisions of the global container terminal operators are very much guided by the geography of containerized trade and the nautical and geo-economic characteristics of the global maritime network. The structure of shipping networks and their underlying commercial relations are subjugated to a constraining geography, particularly around well-defined chokepoints (Figure 2).

In this context, physical geography becomes a structuring element of business geography, with chokepoints as obligatory passage points for global trade. The dual effect of reducing maritime shipping distances and the convergence of shipping routes confers a unique form of connectivity to global trade. Transshipment hubs<sup>2</sup> represent another form of connectivity, particularly active around major maritime chokepoints, with container ports in proximity to Panama, Gibraltar, Suez, and Malacca having transshipment

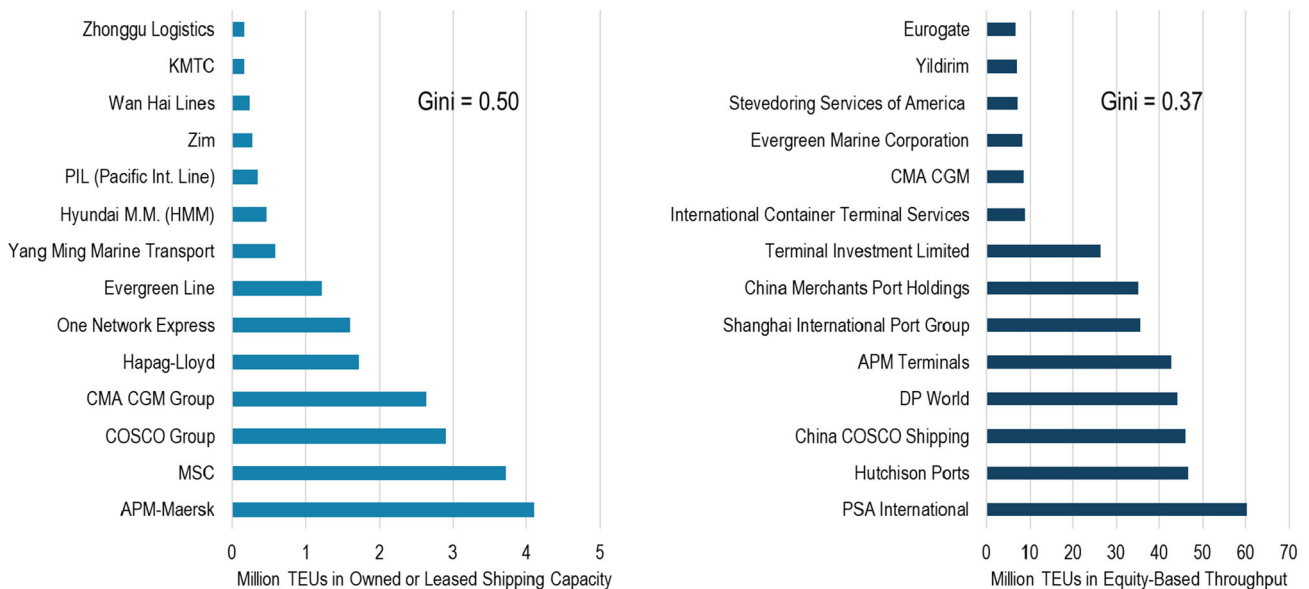
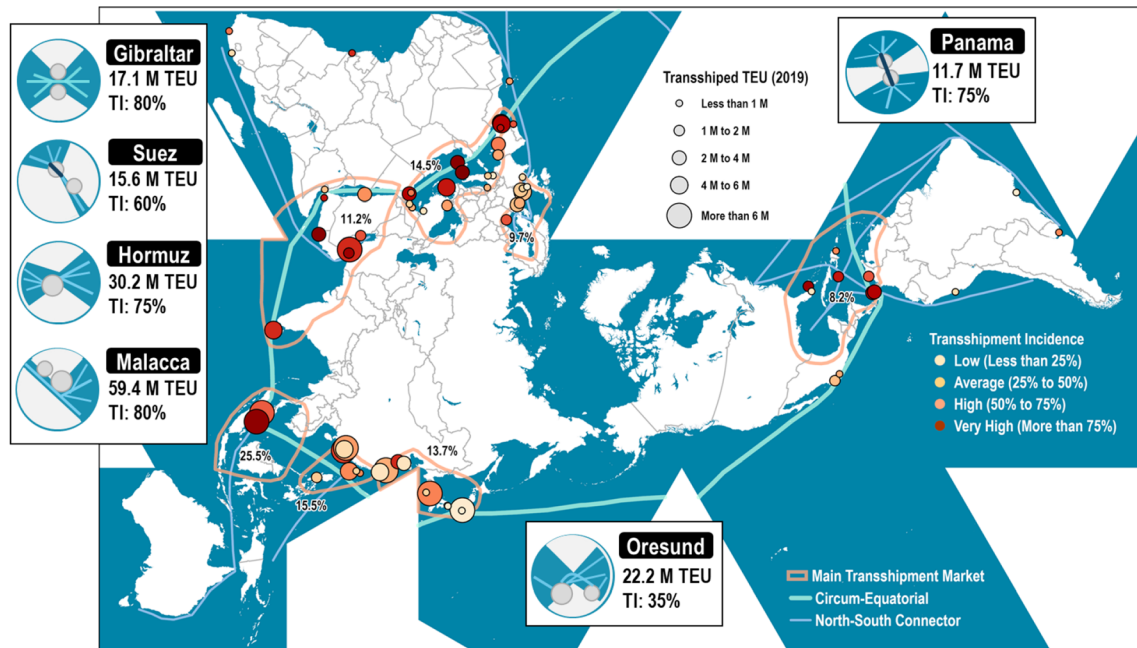


Figure 1 Largest container shipping lines and terminal operators. Note: Data for 2020 for shipping lines and 2018 for terminal operators. Source: Alphaliner and Drewry Shipping Consultants.



**Figure 2** Major shipping chokepoints and intermediate hubs, 2019. Note: TI = Transshipment Incidence. Source: Own dataset collected from port authorities.

incidences<sup>3</sup> above 60%. For instance, of the 59.4 million TEUs handled by ports around the Strait of Malacca, mainly Singapore and Tanjung Pelepas, about 80% strictly involve transshipment cargo. Transshipment hubs support hub-and-spoke services with feeder ports, relays between long-range services, and interlining between different port of call services in a maritime range.

Transshipment hubs are first-tier nodes in a hierarchy reflecting the decisions by shipping lines to organize shipping networks. These first-tier nodes are connecting lower-tier nodes through feeder services. This hierarchy is strongly influenced by geography, with most transshipment activity near the circum equatorial route, at the intersection of north-south connectors, and clustering near chokepoints (Rodrigue & Notteboom, 2010).

Figure 2 depicts the seven transshipment markets capturing most of the global transshipment activity. While gateway traffic is linked with a port hinterland, transshipment traffic is usually not tied to a specific port, inciting competition between transshipment hubs to attract traffic. The Singapore/Tanjung Pelepas port cluster in Southeast Asia represents the world's most significant transshipment market, with 25.5% of the world's transshipment activity. Transshipment is generally perceived as a footloose activity, implying a level

of substitutability within a transshipment market. This can create an active competitive market for port terminals vying for the transshipment business as well as a hub segmentation by shipping lines.

Further, terminal activities have strongly developed in multi-port gateway regions, which provide access to cargo-rich hinterlands. Typical examples include the Rhine-Scheldt Delta (Belgium and the Netherlands), the San Pedro Bay area (Los Angeles/Long Beach), and the Yangtze River Delta and Pearl River Delta in China. Strong corridor-based connectivity supports the gateway functions of these ports to economic centers in the hinterland, combined with robust maritime connectivity to overseas markets. In some cases, the massive import/export flows of gateway ports are combined with considerable transshipment flows. For example, major European gateways Rotterdam, Antwerp, Hamburg, Bremerhaven, Le Havre, Valencia, and Barcelona have a transshipment incidence between 30 and 50% (Notteboom et al., 2019).

The footprint of container terminals is substantial, with the average terminal size around 45 ha (Figure 3). However, this figure is distorted by a small number of very large terminal facilities as the most common size (median) is 30 ha. A Pareto distribution of terminal surface is apparent, reflecting the infrastructure challenges facing maritime

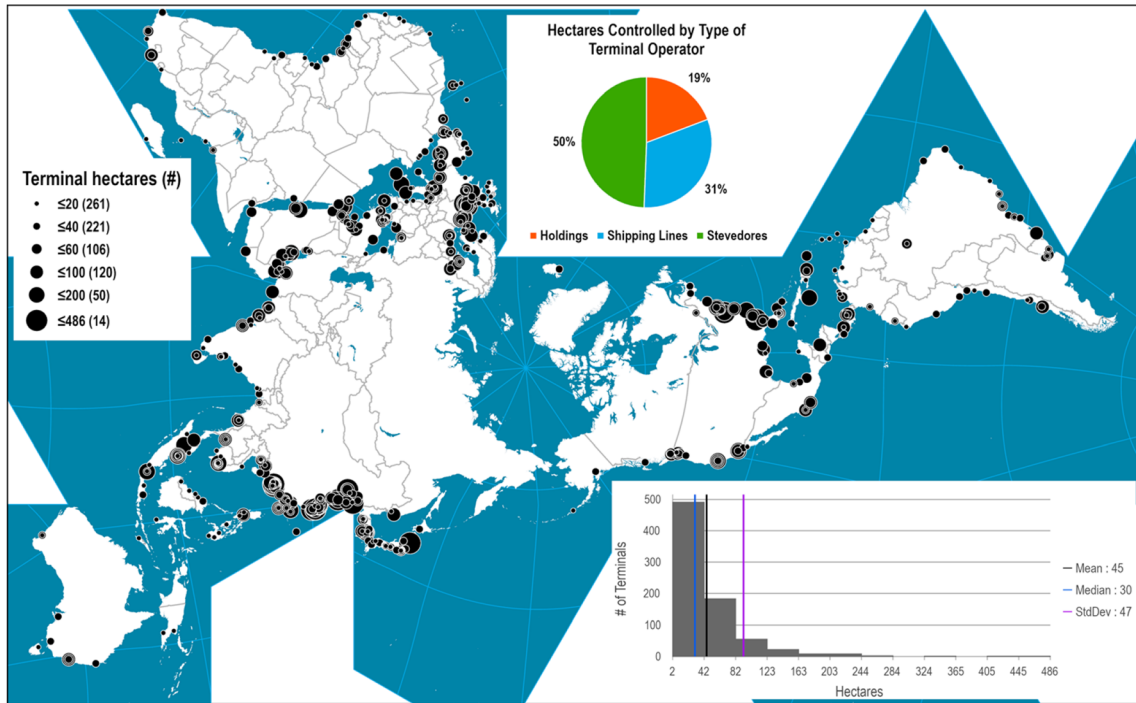
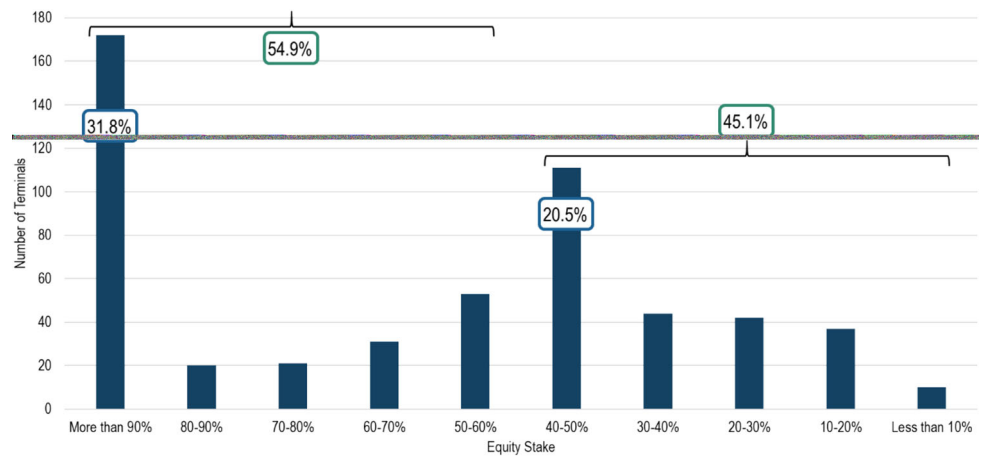


Figure 3 Container terminal surface of the world’s major terminal operators, 2019. Source: Own dataset derived from Drewry Shipping Consultants.

Figure 4 Distribution of terminal equity stakes by terminal operators (N = 541). Source: Own database derived from Drewry Shipping Consultants.



shipping and global trade. Only the largest and most capitalized corporations and holdings are able to be involved as the barriers of entry to develop, operate, or maintain facilities above the mean of 45 ha are extensive. This favors a two-tier corporate system with the first tier composed of large globally oriented terminal operators and the second tier composed of smaller operators with a regional or local focus.

The high spatial concentration of flows along specific routes and cargo handling nodes resulting

from corporatization has led to many efficiencies and has also revealed some vulnerabilities. A significant part of global trade is passing via chokepoints such as the Suez Canal and the Panama Canal. Incidents such as the Suez Canal blockage in March 2021 encouraged shippers and shipping lines to explore alternative routes (south-south route via the Cape, Arctic route, long-distance rail services) given increasing supply chain and network resilience. Moreover, shippers and shipping lines avoid putting all their eggs in the

**Table 1** Classification of global terminal operators. Source: Own elaboration.

Stevedores	Carrier-linked	Financial Holdings
<b>Horizontal integration</b>	<b>Vertical integration</b>	<b>Portfolio diversification</b>
Port operations is the core business; Investment in container terminals for expansion and diversification.	Maritime shipping is the main business; Investment in container terminals as a support function.	Financial assets management is the main business; Investment in container terminals for valuation and revenue generation.
Expansion through direct investment.	Expansion through direct investment or through parent companies.	Expansion through acquisitions, mergers and reorganization of assets.
Public: PSA, HHLA, China Merchants Port Holdings. © PEMP	Public: COSCO.	Public: DP World (Sovereign Wealth Fund).
Private: Eurogate, HPH, ICTSI, SSA.	Private: MSC, APL, Evergreen.	Private: Ports America (AIG), Macquarie Infrastructure (Fund).

same (port) basket by diversifying port choice and investing in multiple terminals in the same multi-port gateway region or transshipment market.

### NETWORK CORPORATIZATION

While state-owned shipping lines are still found in several countries such as China (e.g., Cosco Shipping Group), merchant vessels typically are owned and managed by private companies, ranging from bulk shipping tycoons in Greece and German container fleet owners to Japanese and South Korean industrial conglomerates. Maritime shipping is a highly multinational activity, particularly concerning ship ownership, management, and flag of registry. For example, the containership *Ever Given*, which blocked the Suez Canal in March 2021, is registered in Panama, operated by Evergreen shipping line based in Taiwan, and owned by Shoen Kisen Kaisha, a shipowning and leasing subsidiary of the Japanese shipbuilding company Imabari Shipbuilding. Its technical management is the responsibility of the German ship management company Bernhard Schulte Ship Management. UK Club is the P&I (protection and indemnity) insurer, while the hull is insured by Japan's MS&AD Insurance Group.

Vessels use a vast network of shipping lanes crossing oceans, seas, and passages, which are guided by the international regime of the law of the sea and a series of treaties on free passage.

Transit fees are only levied on major interoceanic canals by government agencies such as the Panama Canal Authority and the Suez Canal Authority. Compared to the relative freedom of navigation at sea, calling at a port comes with operational and financial obligations linked to the nautical access (e.g., pilotage and towage services), the levy of port dues, and terminal use. In the port operating industry, internationalization shifted from a dominantly regional structure, sometimes focusing on a single port, with several port terminal operators establishing a multinational portfolio. This internationalization was supported by corporatization in the port industry, whereby governments retained ownership of port real estate and introduced a landlord port management system. The private sector generally undertakes commercial terminal activities through lease or concession agreements with the public sector represented by the port authority, with exceptions to this port management system found in countries such as the UK (fully privatized ports) and South Africa (ports and terminals controlled by state-owned Transnet). The setting of the landlord port model has led to a massive phase of corporatization in many regions (Farrell, 2012). Corporatization has resulted in more terminals being available for lease and a more active bidding process, allowing well-capitalized terminal operators to win concessions, leading to a concentration of container terminal assets in a limited number of operators. This concentration is

similar to shipping lines (see Figure 1), but even if terminal operations are standardized, operating within a local business environment requires managerial knowledge that is not readily replicable.

Thus, corporatization has supported the emergence of an extensive network of global and regional terminal operating companies (Notteboom, 2002; Notteboom & Rodrigue, 2012), gradually shifting the port competition scene from port authorities to terminal operating companies (Slack, 2007). It has also allowed the setting of new networks and relationships between shipping lines and terminal operators through alliances and particularly through the setting of terminal operating companies acting as branches of shipping lines.

Consequently, the terminal operating industry has become increasingly complex, with competition, objectives, and entry strategies diverging between heterogeneous terminal operators (Notteboom & Rodrigue, 2012; Oliver et al., 2007; Olivier, 2005; Parola et al., 2013, 2015) and differences in local market entry conditions (Pallis et al., 2008). Several categorizations of terminal operating companies have been proposed (see Bichou & Bell, 2007; Olivier et al., 2007; Parola & Musso, 2007; Notteboom & Rodrigue, 2012). Here, terminal operating companies are classified along two dimensions (Table 1).

The first dimension considers the *origins and strategic rationale for investing* in the global terminal infrastructure network:

- *Stevedores*. This group includes independent port terminal operators offering container handling services to a broad customer base. Market expansion allows replicating a unique expertise in terminal operations and revenue diversification. Global terminal operators, such as Hutchison Ports and HHLA, mitigate risks through terminal joint ventures with shipping lines, making terminal ownership structures and partnership arrangements increasingly complex.
- *Carrier-linked*. In recent decades, container shipping lines have developed dedicated terminal capacity to support their core shipping business. The derived benefits involve cost control, operational performance, profitability, and prioritizing their ships during port calls. Terminal operating companies are formed as separate business units or sister companies with terminal facilities operated on a single-user dedicated base or open to third shipping lines. For example, AP Moller-Maersk operates a network of container terminals

through its subsidiary APM Terminals, a sister company of Maersk Line. CMA CGM (through a majority shareholding in Terminal Link), MSC (via a majority shareholding in Terminal Investment Limited), and Cosco (through fully owned Cosco Shipping Ports) are also among the most involved shipping lines in terminal operations.

- *Financial holdings*. Port terminals have attracted several investment banks, retirement funds, and sovereign wealth funds as an asset class with a potential for revenue generation over long time periods. Most acquire an asset stake and leave operations to the existing operating company. Others directly manage terminal assets through a separate terminal operating company. Dubai Ports World (DPW), a branch of the Dubai World sovereign wealth fund, is the largest global terminal operator owned by a financial holding. Terminals have an intrinsic value related to real estate as they occupy highly accessible locations that cannot be effectively substituted. Traffic growth experienced by ports worldwide made terminal assets even more valuable, which attracted a new group of investors such as pension funds. Terminals are also noteworthy for their operational value since they provide revenues linked with the rent they generate. Terminal investments enable private equity firms to diversify their portfolios in different transportation market segments (ports, airports, rail) while simultaneously undertaking a geographical diversification.

Terminal infrastructure located in different regional markets helps mitigate risks, particularly those related to traffic demand fluctuations and the pricing and capacity strategies of competitors. A global portfolio might also help reduce the financial and political risks associated with being active in only one market.

A second dimension in the classification of terminal operators concerns *public versus private ownership* as well as *terminal ownership stakes*. The corporatization of ports worldwide has resulted in a retreat of local public or state-owned entities in terminal operations. However, the entry of global players into the local terminal operator industry did not always imply an infusion of private capital. Instead, it meant that large foreign state-owned terminal operators were moving in. Examples include global investments by DP World (part of Dubai World) and PSA (part of Temasek Holdings),





or the large Chinese state-owned firms Cosco Shipping Ports and China Merchants Holding.

The distribution of terminal equity stakes across a sample of 541 container terminals reveals core corporatization behavior in terms of infrastructure preferences (Figure 4); 31.8% of all terminals have a stake higher than 90%, indicating that many terminal operators prefer full control. If this is not possible, a majority stake above 50% remains a preference. Due to the regulatory framework, such as rules forbidding the majority ownership by a foreign entity of terminal assets or another terminal operator already having a majority stake, another common point of entry (20.5% of all stakes) is a minority stake between 40 and 50%. Multiple minority stakes are usually found among the largest container terminals assuming a well-established gateway function.

### THE EMERGENCE AND GROWTH OF GLOBAL TERMINAL OPERATORS

Internationalization strategies pursued by global terminal operators were initially set to search for investment opportunities abroad (Peters, 2001). This infrastructure development took place over three waves (De Souza et al., 2003). The first wave involved stevedores (HPH, P&O Ports, and SSA) that expanded their operations when port privatization schemes began to be implemented in the early 1990s. Still, in the 1960s and 1970s, Sealand and American President Line (APL) did invest in terminal operations, but at a lower scale and in a much more closed context as public ownership and operation still dominated (Olivier et al., 2007). Following the example of these early adopters, a second wave of terminal operators began to expand internationally (PSA, CSX World Terminals, and Eurogate) in the late 1990s. A third wave involved the entry of major container shipping lines into terminal operations to support their core business in the 2000s. This wave also involved the entry of financial holdings.

The decision of terminal operators to enter a new port (market) and provide substantial infrastructure investments is contingent on firm-specific factors (size and business strategy), terminal characteristics (location, size, stakeholders), and macroeconomic factors (growth opportunities, regulatory framework) (Parola et al., 2013). Outside of taking advantage of organic growth opportunities to develop infrastructure, mergers and acquisitions

(M&A) and bidding for new concessions and land leases are common expansion strategies.

### M&As

A large diversity can be observed in the M&A exposure of global terminal operators (Parola et al., 2015). Three M&A deals in 2001 marked the start of a major reconfiguration of the terminal operating business: Hutchison Ports entering mainland Europe by taking over Rotterdam-based ECT, PSA taking over local Belgian operator HesseNoordnatie, and Hutchison buying ICTSI's International Business Division. The peak level of M&A activity took place in the 2005 to 2007 period, corresponding to years of exceptional growth in container traffic and the ensuing terminal capacity shortages. The case of DP World is illustrative with the acquisition of CSX World Terminals in DP World and P&O Ports in DP World.

Recently, Chinese companies have been actively involved in M&A. For example, the 2016 merger between China Shipping and Cosco led to the creation of Cosco Shipping Ports. In 2017, Spanish company Noatum was taken over by Cosco Shipping Ports. In 2020, China Merchants acquired a 49% stake in the terminal portfolio of CMA Terminals when this portfolio was transferred to Terminal Link (since 2013, Terminal Link has been 51% owned by CMA CGM and 49% by China Merchants).

### Terminal Concessions

Concessions and land leases are one of the most apparent forms of corporatization required by containerization and the setting of container terminals. The prevalent model involves landlord port authorities leasing terminals (or port land) to private terminal operators through long-term concession agreements lasting 25 to 40 years. The responsibility for investment is subject to negotiation through the terms of the concession where respective public and private roles for port infrastructure such as quays and superstructure such as cranes are identified. These terms are part of the bidding procedures setting the terms of the concession. The key issues in terminal leases/concessions have been discussed in port studies with a focus on their function as port governance tools (Notteboom, 2007), bidding procedures and risk-sharing between parties (Theys et al., 2010), the contract design (Juan et al., 2004), performance clauses (Notteboom et al., 2012), the determination of land fees (Ferrari & Basta, 2009), etc.

International business literature has proposed theories on the benefits of long-term vs. short-term relationships, including the duration of agreements and contracts, the types of activities involved, and the relationships between ownership control and location, see e.g., Buckley et al. (2019) on time as an organizing factor in global value chains. Competitive terminal bidding procedures implemented by public entities or port authorities are or should be designed to award a terminal in a fair, equitable, and transparent way. Still, powerful global terminal operators might try to influence the design by engaging in corporate political activity (e.g., lobbying) to achieve favorable policy changes that support the firm's strategic intent and plans (see e.g., Hillman et al., 1999; Funk & Hirschman, 2017). Such strategic behavior can increase the chances of these global terminal operators when bidding for terminal concessions (Pallis et al., 2008).

### Corporatization and Internationalization of Terminal Operators

The emergence, corporatization, and internationalization of the container terminal industry and the observed diversity in global terminal operators can be better understood when using some of the core international business strategy frameworks as identified by Forsgren (2013) and Kano and Verbeke (2019).

Hymer's *Theory of Foreign Direct Investment (FDI)* is based on the assumption that an MNE will engage in FDI if it holds a monopolistic advantage over host-country firms through its unique firm-specific advantages (FSA) (Hymer, 1976). In order for FDI to take place, the benefits of exploiting FSAs internally through the MNE hierarchy should be larger than the additional costs of conducting business in a foreign market. These additional costs used to be high in the container terminal industry. Until the mid-1990s, discriminatory *entry barriers* in the terminal operator industry erected by governments or local port authorities prevented foreign companies from entering local markets in many countries, leaving little room for a foreign terminal operator to deploy its FSAs in an international context. The move towards transparent and open concession procedures implied that local terminal operators face competition from experienced global players who can fully play out their FSAs in the competitive bidding procedure. These arrangements also supported the entry of global players with deep pockets and specific know-how. Global terminal operators

have a notable competitive edge when bidding for terminal concessions (Pallis et al., 2008). They use their scale and scope advantages to outperform other bidders in terms of financial resources and expertise. Resources are moved to locations susceptible to the highest yields, often leading to a concentration of infrastructure investments in the most accessible gateways and hubs.

The *theory of organizational capabilities* argues that MNE boundaries are determined by the firm's reservoir of capabilities and knowledge and how the firm replicates its home-country FSAs abroad using proper governance mechanisms to coordinate knowledge flows (Kano & Verbeke, 2019). Global terminal operators try to replicate home-country FSAs abroad while at the same time seeking a strategic fit by adapting the company to each of these foreign environments. The success of the global terminal operator will then be determined by the ease with which knowledge flows across locations and the establishment of proper governance mechanisms to coordinate these flows. Terminal operators achieve greater efficiency and lower costs by establishing standardized systems across the entire terminal network. This can imply using a central purchasing department that centralizes all orders of terminal equipment and digital infrastructure. Knowledge-sharing arrangements are implemented to share the results of R&D efforts with all the terminals of the network. Gaining a competitive advantage in the terminal operator industry is increasingly dependent on innovation geared towards higher operational efficiency, competitive hinterland connectivity arrangements, and the increased visibility and transparency of cargo and data flows. IT plays a pivotal role in the strategic initiatives the operators have engaged to leverage international opportunities. For example, PSA initially developed terminal activities in its home port Singapore before opting for an internationalization strategy. The operational scale of its activities in Singapore helped PSA to acquire exceptional FSAs in terminal handling and related digital solutions. These FSAs were used to roll out an international terminal network through M&As and the successful bidding for new terminal concessions. This development was accelerated by increased competition at its Singapore terminals, not least from newcomer Tanjung Pelepas in Malaysia.

*Contingency theory* is built around the notion that an optimal MNE governance depends on the nature of each environment in which the MNE operates.



Thus, MNEs seek a strategic fit by adapting the company to each of these environments. The information-processing view of the MNE (Egelhoff, 1988) stresses the role of formal coordination and control by headquarters to achieve the necessary adaptation, while the differentiated network view (Bartlett & Ghoshal, 1989; Mudambi, 2011) underlines the importance of differentiated management of dispersed local units in the network, subsidiary autonomy, and the balancing of local responsiveness with global integration. *Institutionalization theory* argues that the internationalization of an MNE is the result of a mutual adaptation between the firm and the multiple institutional environments where it operates. The MNE has to deal with each local political, social, and economic context, and must achieve legitimacy by gradually adapting to these local environments (Powell & DiMaggio, 1991). From a *business network theory* perspective, the emergence of an MNE is a cumulative, stage-wise process, determined by the nature of the firm's extant experience and market knowledge (Andersson et al., 2002; Kano & Verbeke, 2019). In line with the above theoretical perspectives, each terminal faces a different operational (cargo mix), institutional (labor regulations, government policies, port governance model), and economic environment (hinterland markets).

Global terminal operators adapt to local institutional environments and rules in each home market. Thus, successful internationalization largely depends on the ability of the terminal operator to insert itself into the business networks of host countries, access market knowledge, and enhance the capabilities of the local subsidiaries. To cope with these diverging environments, some terminal operators treat individual terminals as independent business units. Such governance settings can result in power struggles inside the company, as the interests of the local network and the MNE headquarters might deviate. The organizational forms adopted by terminal operators to internationalize their business and create partnerships with other firms are strongly entwined with local institutional settings. Olivier (2005) refers in this context to the role of 'place-specificity' and 'territorial embeddedness' linked to the home market in understanding expansion strategies. The home ports typically remain very important in the network of these operators. Similar to what happened in the airline industry (Goetz & Sutton, 1997), some carriers entering the terminal industry have developed 'fortress hubs', which serve as strongholds where,

apart from the dominant carrier, no other carrier has been able to establish their operations.

While global terminal operators usually draft strategies on where to invest next, their actual entry in regional markets is very much dependent on their success rate in dealing with the opportunities offered in terms of concessions or M&As. Territorial institutions and strategic action play a key role in opening windows of opportunity at different competing locations for terminal investment and growth (Jacobs & Notteboom, 2011). When a window of opportunity for entry at one location occurs, another competing location might react by also creating investment opportunities. Such interactions can multiply the number of terminal entry options for global operators in the same port region.

### **IMPLICATIONS OF THE CONSOLIDATION AND INTERNATIONALIZATION IN THE TERMINAL OPERATING INDUSTRY FOR INTERNATIONAL BUSINESS POLICY**

In the past few decades, the setting and development of the global maritime container terminal infrastructure and network have greatly contributed to facilitating global trade and overall economic globalization (Bernhofen et al., 2016; Levinson, 2016). The sheer scale of company-specific global networks and assets contributed to the realization of operational economies of scale and scope, resulting in a gradual decrease in transport and logistics costs for international business. International business policy developments have contributed to the emergence and growth of global terminal operators, for instance, through the privatization of (national) ports, and the development of proper regulatory frameworks on terminal lease and concession processes in ports.

The common perspective is that policymakers and regulatory bodies should continue to incite cost reductions and efficiency improvements. The requirement that all relevant costs, including environmental and congestion externalities, is to be properly internalized along supply chains is particularly challenging. As the container shipping industry, terminal operators are mainly private entities operating in a transnational environment. This seriously restrains the realm of policy interventions, usually around competition policy and the terms and conditions of terminal concessions.

The consolidation trend in container handling and the emergence of large global terminal

operators can generate concerns among policymakers. On the one hand, the extensive terminal networks are often considered an effective means to counterbalance the power of carrier combinations in liner shipping, realize economies of scale and scope, and optimize the terminal function within logistics networks. At the same time, high concentration levels raise questions on whether market forces are sufficient to prevent the abuse of market power on a global scale, the formation of regional or local monopolies in cargo handling, and the involvement of landlord port authorities in terminal operations (Notteboom, 2002). International business policy could impose restrictions on institutional factors, particularly regulatory and anti-trust policies monitoring oligopolistic and monopolistic risks in relevant geographic markets. The vast majority of the terminal-related M&As were subjected to scrutiny by national or regional competition authorities. These institutions more than once intervened to avoid the potential abuse of a dominant position of the new entity in the relevant geographic market, or to ensure competitiveness through safeguarding low entry and exit barriers. This policy issue is expected to become even more salient given the continued high level of consolidation in the terminal operator industry, and the key role terminals and seaports play in developing more resilient and efficient supply chains.

International business policy might also influence how global terminal operators extract (local) economic rent. Market consolidation increases the risk of a drain of economic rent towards powerful players. Ports become increasingly dependent on external coordination and control by (foreign) actors who might extract a large share of the economic rent (wealth) produced by ports and who are often guided by the aim of creating shareholder value. A few countries, such as Germany, remain largely focused on incumbent domestic terminal operators, thereby leaving little room for foreign operators to enter the national port system and to engage in the practice of 'exporting' profits. Local and national policymakers might also want to ensure the local community is getting a fair return for the scarce local resources (such as land and human resources) used for creating economic rent in the terminal business. Under such circumstances, terminal concessions, particularly at new facilities, are subject to increasing scrutiny, while government agencies, including public port authorities, are designing policies to

ensure that part of the value-added created by global terminal operators remains local. For example, the port authority of New York/New Jersey includes clauses in port lease/concession agreements stipulating that if a local terminal operator is sold to another (foreign) party, part of the realized surplus value of the associated financial transaction will flow to the port authority.

Investments of foreign terminal operators can be controversial since their hold on strategic port facilities may imply a loss of sovereignty and go against long-term national interests. A salient example was the controversy surrounding the takeover of P&O Ports by Dubai-based DP World (Beisecker, 2006; Simpson, 2006). The global portfolio of P&O Ports included some terminals in major American ports such as New York, Baltimore, Miami, New Orleans, and Philadelphia. In a post-September 11 setting, where security issues had become highly controversial, the deal stirred a public debate, particularly since Middle Eastern interests control DP World. After shareholder approval, DP World received approval from all relevant regulatory authorities, including the Committee on Foreign Investment in the United States (CFIUS). However, the US Congress delayed the sale, while the US House Committee on Appropriations even voted to block the deal. In the end, DP World delegated the US terminal assets of P&O Ports to American Insurance Group (AIG), which were later incorporated into the portfolio of Ports America. International business policy practices did not prevent DP World from entering the US terminal market. Still, in the end, political controversy made DP World decide to abandon the acquired US terminals.

While the setting and development of the global maritime container terminal infrastructure and its corporatized network have been largely driven by private MNEs, the institutional environment and governance arrangements in the global terminal operating industry are gradually changing as a number of large state-owned companies add a strong geo-economic and geopolitical dimension to network development. Chinese operators present a particularly salient case. State-owned firms like Cosco Shipping Ports and China Merchants play a role in deploying international port infrastructure investments as part of the Belt and Road Initiative (BRI) (Yang et al., 2022). This initiative was launched in 2013 to enhance economic development and cooperation from the Western Pacific to the Baltic Sea and improve infrastructural



connectivity in Asia and Africa. The BRI program is a centerpiece of China's foreign policy and domestic economic strategy (Huang, 2016). At the seaport level, Chinese companies have substantially contributed to key port expansion and rehabilitation projects across Asia (Sri Lanka, Pakistan, Southeast Asia), Africa (Djibouti, Kenya; see Yang et al., 2020), and parts of Europe (Piraeus, Valencia, and Zeebrugge). The investment spree of these state-owned global terminal operators is well aligned with the geo-economic ambitions of China (Chen et al., 2019). However, some argue that Chinese involvement in port investments poses a direct security risk as commercial objectives are combined with military and geopolitical motives (see Devermont et al., 2019). Further, the economic return of such infrastructure investments remains questionable with the potential risk of devolution from this form of state enterprise corporatization in the terminal operating sector. Therefore, commercial strategies pursued by terminal operators can become important national policy issues.

### **DISCUSSION AND CONCLUSIONS: QUESTIONING THE RESILIENCE OF CORPORATIZATION IN THE MARITIME INDUSTRY**

Maritime container shipping reveals a global hierarchy in infrastructure assets with technical characteristics and capital intensiveness shaping their management and operations. However, it was argued that the business and management literature could benefit from a better understanding of the importance of infrastructure as a framework for explaining economic processes, notably when transport infrastructures are transnational and capital-intensive. Transport infrastructure enables economic opportunities and the development of comparative advantages, but it must be underlined that their inherent attributes shape the organizational structures using them, particularly their scale and scope. Business operations cannot be separated from the infrastructure context, with corporatization as an adaptation strategy to the limitations imposed by a highly regulated environment that prevailed before the 1990s.

In the maritime sector, the fundamental characteristics of container transportation, a standard scalable transport unit, resulted in the setting of large maritime shipping lines and terminal operators able to support the ongoing growth of international trade and related supply chains.

Economies of scale at the modes and terminals beget corporate structures that provide the necessary capital, infrastructural and managerial expertise. No other transportation sector can develop economies of scale and massification to the extent of maritime shipping. Evidence underlines that corporatization is a process that allowed the development of an extensive network of maritime infrastructure, with the container terminal as the core element.

Still, there is no single model as corporatization led to a diversity of strategic orientations, such as terminal operators emerging from stevedoring, maritime shipping, and financial backgrounds, which can be privately or publicly owned. This underlines that the setting of containerized global trade and logistics systems is the outcome of an infrastructure path dependency. The container terminal business is a highly capital-intensive industry where assets are owned or leased. Asset management is a key component of corporate operational and commercial success.

Capacity management remains complex, as high volatility in demand must be absorbed by a rather inflexible terminal and fleet capacity in the short run through revisions of investment schemes, equipment purchases and maintenance, and overall asset deployment strategies. The implications of this tension range from severe terminal overcapacity situations (as observed in 2009) to structural terminal congestion, as exemplified during the supply chain crisis that started in late 2020.

The supply chain crisis revealed some of the structural shifts in the global maritime container terminal infrastructure and network that have been shaped over the past decades. Understanding these shifts is crucial when preparing for future actions and initiatives in international business policy.

First, while the extraordinary conditions in the market could be seen as the result of a 'perfect storm', the supply chain crisis clearly surfaced the limits of contemporary supply chain management principles such as just-in-time (JIT). Cargo owners, logistics service providers, carriers, and terminal operators have experienced the full impact of a decade-long focus on cost-cutting and lean supply chain processes. This has left them with minimal inventories and a lack of buffer capacity to cope with disruptions, underlining the importance of supply chain resilience (see McKinsey Global Institute, 2020). Improving supply chain and network resilience will require substantial coordination and cooperation between market players and public

policymakers in view of effectively addressing key challenges such as increasing the number and geographical spread of suppliers, having capabilities to substitute suppliers and distribution channels, the insertion of buffers or slack capacity in supply chains, the willingness to pay for such additional capacity and the question of who should provide the capital investments (Kent & Haralambides, 2022; Notteboom, 2022).

Second, the supply chain crisis implies some level of disconnection between the tangible goods that are passing through the global maritime container terminal network and the intangibles (brands, R&D knowledge, etc.) that drive the demand for these products (see e.g., Mudambi, 2008). While transport and logistics are often considered as a derived demand, the strong consumer demand for many goods based on their intangible brand value has been tempered by port congestion and broader supply chain disruptions. In other words, these demands could not be fulfilled, or at least were subject to delays, which can have longer-term implications on demand patterns. This turn of events might lead to a new reality in which the tangible good (including the underlying logistics) becomes the foundation around which the intangibles are built. Given these developments, international business policymakers are challenged to focus on logistics factors that promote cargo routing flexibility, sustainability, resilience, reliability, and transit times. These are expected to play a more significant role in shaping brand value. For example, the US Federal Maritime Commission (FMC) and the European Commission (EC) are developing regulatory initiatives to ensure logistics players (which also include terminal operators) meet the service quality obligations agreed with their customers.

Third, the supply chain crisis demonstrated some level of rigidity in the global maritime container terminal infrastructure and network, which manifested itself in many ways. For instance, many cargo owners could not find alternative routes or ports of call to reroute their disrupted supply chains, while customers were confronted with shipping lines who could not, or were unwilling to, ship cargo at a rate and schedule reliability conditions stipulated in long-term freight contracts. Rising capacity shortages in terms of ships, terminals, hinterland transport equipment, and warehousing facilities exacerbated the observed rigidity levels (Notteboom & Pallis, 2021). Network rigidity also comes from the network's high reliance on key gateway

and hub ports and the main trunk lines that handle or carry most of the international trade flows. However, part of the rigidity problems resulted from the inefficient or sub-optimal use of the available capacity. A lack of data availability or data sharing among supply chain partners can limit transparency and visibility in the network, thus preventing a more efficient utilization of existing assets through cargo bundling and prioritization. Furthermore, in the past, the large firms active in different aspects of global supply chain management (large 3PL firms, carriers, etc.) have focused on developing and optimizing their own global networks without considering possible synergies that could emerge from strategic collaboration within networks of rival firms. Such collaboration requires closer scrutiny as national economic interests are impacted by capacity shortages resulting from competing corporate strategies (Rodrigue, 2022).

Fourth, terminal operators as asset managers are continuously challenged to use appropriate governance and business models to expand the global maritime container terminal infrastructure network in an efficient, sustainable and resilient way. Policymakers should provide guidance in this process by deploying a set of tools and instruments such as penalty and incentive pricing, monitoring and measuring, market access control, and regulations on standards and good practices.

The supply chain crisis demonstrated the key role of shipping and ports in facilitating global economic development and trade. Terminals run the risk of becoming strategic assets used by governments to realize specific geo-economic and geopolitical ambitions. When such a view becomes widely adopted, the global maritime container terminal infrastructure network could face nationalization of key terminal infrastructure or at least a much stronger level of oversight by government agencies on what terminals can and cannot do in terms of capacity development and pricing. An emerging paradigm in the corporatization of the container terminal industry will place a greater emphasis on its resilience as pressures will be felt from both the commercial sector (its customers) to be more reliable and from the public sector incited to intervene out of concern for its negative impacts on national economic interests.

This paper demonstrated that international business policy has facilitated the emergence and growth of global terminal operators through the privatization of (national) ports and the



development of proper regulatory frameworks on terminal lease and concession processes. However, the consolidation level in container handling, the omnipresence of large global terminal operators and the COVID-19-related global supply chain crisis pose challenges to policymakers in the areas of (1) ensuring effective market competition and the fair distribution of economic rents generated locally; (2) dealing with the geo-economic and geopolitical dimensions of global terminal network development, and (3) advancing regulatory frameworks that should facilitate market players to seek necessary improvements in logistics performance in terms of cargo routing flexibility, sustainability, resilience, reliability, and transit times.

This paper shed light on the broader policy implications of the growing internationalization and corporatization in the terminal operating industry, also in the light of the more recent global supply chain crisis, without having the ambition to outline which concrete policy initiatives should be

developed globally and/or in specific parts of the world. Thus, this paper discussed the contours and areas for international business policy initiatives that have the potential to change the behavior of firms within the international business domain development. Obviously, every single concrete policy action requires a profound evaluation and analysis before it can be implemented effectively.

## NOTES

<sup>1</sup>Twenty-foot equivalent unit; a standard container with a length of 20 feet.

<sup>2</sup>A transshipment hub is a large port facility specializing in handling container cargo between shipping lanes (ship-to-ship cargo).

<sup>3</sup>The share of ship-to-ship volumes over total volumes.

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