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THE PORT CITY IN MULTIDISCIPLINARY ANALYSIS

César Ducruet¹

In memory of Rachel Rodrigues-Malta and Olivier Isaac

ABSTRACT

The inherent complexity of the port city has drawn attention from a vast number of scholars belonging to a variety of scientific fields. While a full and exhaustive review would reach beyond the scope of this chapter, it proposes evaluating the level of cohesion of port-city research through a classification of main study areas and their outcomes. Multiple definitions of the port city are both a cause and a consequence of the fragmentation of port-city research. There is a necessity refining the status of port-city research within mainstream approaches on either ports or cities.

1. THE PORT-CITY NEXUS IN SOCIAL SCIENCES

Over the last five decades, the literature on port cities has continuously and rapidly been growing. Research in this field became paradoxically more intense as many port cities were actually losing their port activities and maritime identity. The concept of port city itself has thus become blurred. Despite the number of models and case studies available in the literature, there is still very little evidence about the specificity of nowadays port cities compared with other cities. The lack of precise data often prevents from sector-specific comparisons that would determine why ports remain socially, economically, and culturally important in some cities and not in others. In a world where 90% of trade volumes occur by sea, ports and maritime transport remain more important than ever, but the forms and mechanisms of their local embeddedness have greatly changed. Yet, such issues are explored through a mosaic of approaches scattered across the whole disciplinary spectrum of social sciences rather than by a consistent research body having its own concepts and tools. It is the goal of this chapter to attempt classifying existing research in the following fashion. First, it reviews how the concept of port city has been defined as well as its variants in space and time, according to the

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level and nature of port-city relations. Second, it analyzes how scholars have approached the internal organization of the port city, where contemporary changes are most apparent and readable. We conclude about the cohesiveness of existing research on port cities and on possible avenues for further investigations in this field.

1.1 Definition(s) of the port city

Many concepts throughout social sciences vary in their definition and contents from one discipline to another, but few concepts face such a lack of definition as the port city (Chaline, 1993, 1994). Not only scientists but also practitioners have highlighted this theoretical lack. In his attempt defining common goals to a set of places under the umbrella of the *European Conference of Peripheral Port Cities*², Morvan (1999) deplored the absence of a clear definition and methodology that would facilitate comparisons and the elaboration of redevelopment projects. At a conference on *Living and Residing in the Port City*, Brocard et al. (1995) rightly noticed the contrast in the literature between numerous examples of port-city relations and the rarity of scientifically valid concepts explaining such relations. The port city has in fact many definitions pointing at the diversity and constant evolution of this particular object. In spite of embracing the totality of the port city concept, existing definitions reflect upon temporary states, sometimes in a contrasting – and somewhat contradictory way.

The simplest definitions converge in defining the port city simply as a city exerting port and maritime activities. It is also considered as a communication node between land and maritime networks developing auxiliary activities and having a strong influence on the spatial organization of the outlying region (Brocard, 1994). This led to the overlap made between port city and *gateway city*, the latter concept being originally defined by Burghardt (1971) and further applied to the port city case by Bird (1977; 1983) in order to insist on its fundamental difference with the *central place* whose influence is limited to the adjacent region, whereas the port city has the uniqueness of connecting long-distance maritime forelands (Pearson, 1998). Indeed, the concept of port triptych proposed by Vigarié (1979) systemised the idea of a hinterland-port-foreland continuum, with a ‘French school’ focusing on forelands and a ‘Dutch school’ more interested by hinterlands. Port-city relations in fact cover a wide range of themes related with logistics, tourism, tertiary activities, and planning, as in proposed classifications (Bienfait and Delsalle, 1989; Amato, 1999).

² <http://www.cvpp.eu/english/>

Another possible definition insists more on the intensity degree of port-city relations and the imbalanced direction of the mutual socio-economic influence between port and city. The port city can be considered as a “system” on its own (Forno, 1985): it is a city where port and maritime activities have such a strong influence on the local economy that the city depends on the port to exist. Such a conception is often found in the work of historians, in the case of Marseille (Borruey, 1992; Borruey and Fabre, 1992), but also Anglo-Saxon historians of the colonial world (see Broeze, 1989, 1997). The latter considered that port cities had sufficient particularities to form a distinct urban category, implicitly claiming that every port city is governed by identical mechanisms. In the same vein, the *cityport* concept proposed by Hoyle (1992) translated the spatial and economic symbiosis between port and city. Such views were influenced by the fact that most major cities of the world are or have been commercial ports (Dogan, 1988) and still maintain port activities nowadays as part of their role of global cities (Sassen, 1991). There remains a debate about whether port-city relations are based on a reciprocal breed (Vigarié, 1979), two independent dynamics (Boyer and Vigarié, 1982), a concomitant but indirect mutual enhancement (Vallega, 1983), or a spontaneous interaction (Goss, 1990). In reality, port-city relations change over time, resulting in various configurations of port-city relations, each having its own logics.

1.2 Time and space variations

The function and economic structure of the port city depend on a vast number of elements ranging from physical conditions of the local site to the situation in global trade patterns (Thayer and Whelan, 1989; Cartier, 1999). This led scholars distinguishing among different types of port cities. For Vigarié (1979), cities with a dominant port function (e.g. Le Havre) differ from regional industrial cities that are more concerned with landward transport (e.g. Rouen, Manchester, Szczecin) and from service cities often being coastal capitals (e.g. New York, London, Hamburg, and Copenhagen). This typology is similar to the ones of O'Connor (1989) and Marcadon (1997) based on the level of port activities. A synthesis was proposed by Ducruet and Lee (2006) as showed in Figure 1, where the balanced profile of the *cityport* is located in the centre, surrounded by a number of imbalanced profiles based on the respective importance of urban centrality and maritime intermediacy.

[Insert Figure 1 about here]

Such configurations may also reflect successive development stages of one same port city over time (Hayot, 1988). In such respect, historians proposed evolutionary models of port-city relations. Based on Asian examples but with a general focus, the model of Murphey (1989) described a process of port-city functional separation, from the dominance of the port to the dominance of the city. As the urban economy develops new additional functions, it becomes less and less related with port activities while reaching a final stage of autonomy. Similar trends are found in the spatial models of port-city separation proposed by Bird (1963) and Hoyle (1989), in which modern port terminals shift from the urban core, and former port areas are redeveloped for urban use. Although the physical site may have been responsible for the decline of some ports among other factors (Jackson, 1983), the evolution of port cities is better understood by their overall ability to ensure their global connectedness (Murphey, 1988). A strong correlation between urban hierarchy and port hierarchy has been the ‘rule’ since the early development of historical sites in many regions, such as in the Atlantic (Broeze, 1985; Knight and Liss, 1991; Konvitz, 1994), Africa (Wiese, 1981; Hoyle, 1983), Europe (Konvitz, 1978; Hoyle and Pinder, 1992; Lawton and Lee, 2002), and Asia (Basu, 1985; Jones, 1990). However, inequality in the adaptation to new technological standards (e.g. containerisation) and the lack of space in the urban core, among other factors, have put in question this overlap. Cities may have continued to develop for other reasons than that of just having a port, such as London (Chardonnet, 1959), Buenos Aires (Socolow, 1991), Vancouver (Forward, 1984), Calcutta (Kidwai, 1989), Naples (Vallat, 1993), Los Angeles (Marchand et Scott, 1991), Rotterdam (Boyer, 1991), Hamburg (Grossmann, 2008), and several Chinese port cities (Zhang, 1996; Okuno, 2000; Wang and Olivier, 2003). Such phenomenon recalls the theory of the spatial economists Fujita and Mori (1996) according to which a given port will create urban development under specific conditions only. They notably argue that port-related urban growth may not occur if the port city is strongly linked to another urban core, due to the lock-in effect of urban systems.

However, Pumain et al. (2009) rightly pointed at marked differences in the trajectory of some port cities, which fluctuated according to the importance of the port for inserting the city into trade networks at different time periods. Recalling the idea of port life cycles (Charlier, 1992) and questioning the ineluctable separation process described in existing models, Ducruet and Lee (2006) proposed an empirical verification using a relative concentration index based on urban population and container throughput for highlighting types of port-city trajectories between 1970 and 2005. Results for selected port cities (Figure 2) may be read according to

the following trends³: (a) continuous decrease, (b) increase and decrease, (c) decrease and increase, (d) continuous increase, and (e) complex fluctuations. They interpreted such differences by the fact that some port cities are more efficient than others in answering common challenges such as inter-port competition, changing trade patterns, and congestion issues at the port-city interface. In addition, this analysis reveals regional and global shifts among cities in the respective importance of their port and urban functions.

[Insert Figure 2 about here]

1.3 Measuring city-port interactions

Although the changing fortunes of ports have put in question the idea that port development creates urban and regional development “automatically”, ports have continued to be seen by some scholars as economic engines through their interaction with the urban service sector rather than through physical operations of cargo transfer (Le Chevalier, 1992; Vérot, 1993; Pesquera and Ruiz, 1996; Seassaro, 1996; Vallega, 1996; Haynes et al., 1997; Amato, 1999; Beaurain, 2001; Baudouin, 2001). With Table 1 as complement, it is possible to categorize a number of empirical studies looking at the changing economic linkages between port and city:

[Insert Table 1 about here]

- **Economic impact, spillovers, and value-added of port activities** constitute a distinct research area marked by limited access to disaggregated data and comparability of the results. Although port impact studies provided by various organizations (e.g. governments, port authorities, consultants, or research institutions) provide detailed estimates for a given place, critiques point at their lack of transparency in terms of data source and measurement tools (Vleugels, 1969). The lack of data on trade flows and transactions in monetary value is seen by Lemarchand (2000) as the biggest limit to such studies, forcing scholars using broader metrics such as tonnage figures (Wharf and Cox, 1989; Charlier, 1994a) or employment figures (Gripaios and Gripaios, 1995; Musso, 2006) to estimate the impact. Other authors apply specific methodologies to a given port depending on data

³ The port-urban relative concentration index equals the share of port’s traffic in total regional traffic divided by the share of city’s population in total regional population, on the level of world regions. In the figure, we calculated for each city the share of the relative concentration index over the total of the period so as to normalize the results and better group port cities of similar trajectory type.

availability (Haezendonck et al., 1999; Coppens, 2007). This approach is often proposed by economists.

- **Comparative analyses of urban and port dynamics** produced contrasted results, with a lack of correlation in France over the last 20 years (Steck, 1995), a decreasing correlation between demographic size and port traffic in India since 1911 (Kidwai, 1989), and a bell-shaped correlation curve on a world level between demographic size and container traffic of port cities, confirming a hierarchical diffusion of containerization among larger cities from the 1970s (significant correlation), and the combined effect of lack of space, congestion, traffic concentration, and port competition since the 1990s (lowering correlation) (Ducruet and Lee, 2006). Other works showed the lower growth of added value of port cities compared with non-port cities in Europe (Lever, 1994), and the lower performance of traffic at ports situated within regions specialized in the industry sector, while traffic performance is positively associated with unemployment and specialization in the service sector at port regions situated in advanced economies (Ducruet, 2009).
- **Statistical analysis of urban and port indicators:** the European-wide study by Rozenblat et al. (2004) gathered numerous indicators on port and urban functions, showing interesting regional trends in terms of unemployment differentials, range effects, and accessibility issues (see Chapelon, 2006). The analysis by Warsewa (2006) of numerous port and urban indicators allowed for a very detailed comparison of eight European port cities having in common to search for revitalization solutions in the context of the EU project EPOC⁴. Multivariate analysis applied to combined urban and port indicators on a world level revealed the strong regional dimension of some trends such as port-city opposition or port-city combination (Ducruet, 2008), confirming the uniqueness of European port cities compared with other regions of the world. More recently, Jacobs et al. (2010a, 2010b) proposed a worldwide measurement of the correlation between the location of maritime advanced producer services (e.g. ship finance, maritime insurance, brokerage, etc.) and the level of port activities. It confirmed the earlier works of O'Connor (1989) and Slack (1989a) showing a higher correlation between service activities and urban size than with port traffic volumes. In addition, Ducruet et al. (2010) confirmed that

⁴ <http://www.interreg3c.net/sixcms/detail.php?id=2481>

urban demographic size of the port city is one key explanation to the level of commodity variety at European ports.

INTERNAL ORGANIZATION OF THE PORT CITY

A large research body focuses on the way port cities are organized internally. We divide this literature among two levels: metropolitan level and waterfront level, since the two are often addressed separately.

2.1 Metropolitan level

Although it has been recognized that port cities have a relatively simple morphology due to the convergence of main arteries towards the waterfront (Randall, 1988), this specific pattern has rarely been integrated in general models of urban development (Gleave, 1997). Multiple approaches to formalize recurrent patterns of urban structure have been proposed by architects, urban planners, geographers, and economists. Their models vary in scale from the waterfront area itself to the whole coastal metropolitan area, and also depending on their time variations. This search for regularities resulted in several useful syntheses such as the one of Zaremba (1962) showing different types of port-city-industry-transport configurations, of Bird (1963) and Vigarié (1967) with successive stages of port-city separation in Europe, and McGee (1967) on the specific Asian trend. More recent models are mostly static (Kosambi et al., 1988; Hudson, 1996; Eliot, 2003; Frémont and Ducruet, 2004; Lee and Ducruet, 2006), except the seminal work of Hoyle (1989) about the successive stages in port-city separation, which applies mostly to Western port cities. The addition of another stage Hoyle's model revealed strong contrasts among researchers: Lee et al. (2008) proposed a stage of "general city" where the separation is achieved, while on the contrary Wiegman and Louw (2010) proposed a new phase where port-city relations are renewed and get stronger. Lee et al. (2008) also made a comparison with the Asian trend (consolidation model) where ports and cities remain interdependent despite immense pressures felt at core areas, while Lee and Ducruet (2009) provided a specific spatial evolution model of the global hub port city.

Far from finding direct correspondence among these dispersed works, it is worth noticing complementary efforts from an empirical perspective. For instance, Donnefort et al. (1992) proposed an atlas of port-city relations in the French port town of La Rochelle, mapping many port-related data such as commuting patterns of port employees, socio-economic information

at the intra-urban level related with port and maritime activities, etc. The changing location of port-related activities inside the urban area has also attracted the attention of scholars willing to understand the emergence of new centralities (Slack, 1989b; Lee and Ducruet, 2009).

Such works were complemented by a look at the relevant spatial scales for port and city to coordinate their development plans, with the idea to go beyond the administrative zoning hampering port-city cooperation and the emergence of joint projects (Wolkowitch, 1976). However, the definition of these levels is largely dependent on each case study, due to the difficulty systemizing them, as seen in Table 2.

[Insert Table 2 about here]

The definition of the relevant study area is thus crucial, although some works have verified the complexity of port-city relations due to the intermingling of various scales and actors locally (Rodrigues-Malta, 2001; Kreukels, 1992, 1995), the port being often controlled on the national level by the central government, thus having a different view than that of the city on local issues. The French case was exemplified by Collin (1993) while Frémont and Ducruet (2004) explored the case of Busan where the city had no choice but to levy a container tax on each truck passing through the city to and from the port, as a means lowering negative impacts. Governance and coordination also rest on the identity and culture of interested parties, the port being more or less integrated in local development projects of urban and regional authorities (Brocard, 1996, 2000). In-depth analysis of the evolution of port-city planning and development has been done in political science comparing Le Havre and Southampton (Fouilland, 2003), identifying periods and projects where collaboration mechanisms were most fruitful. Most other analyses of port-city interactions traditionally focused on the area where spatial, cultural, and functional changes were most visible: the waterfront.

2.2 Waterfront level

Far from addressing a complete overview of waterfront redevelopment studies, we wish to draw attention on main approaches and outcomes in this field. First, the waterfront is not always identical to the port-city interface in terms of their respective location and function. While the waterfront simply depicts the portion of the city adjacent to the water, the port-city

interface has a wider meaning since it is an “area in transition” (Hayuth, 1982) with mixed - and often overlapping – land uses, which includes the waterfront area but also any other area where port and urban functions coexist, such as the Maritime Industrial Development Area (MIDA). The dereliction of many port areas around the world has attracted the attention of many researchers as port cities became a fertile ground to analyze global-local processes of urban transformation. Research on such topics may be classified as follows:

- Generalizations of the waterfront’s specificities with regard to land use patterns (McCalla, 1979), land rent distribution compared with CBD (West, 1989), and theorisation of the waterfront as spatial and functional system (Hayuth, 1988);
- The documentation on the quantity of derelict land areas in various ports (Chaline, 1999) and the description of land-use conflicts in various port cities, notably in the United States (Bonneville, 1986; Chaline, 1988; Goodwin, 1988; Vermeersch, 1999) where the process emerged in the 1950s before spreading overseas (Church, 1990; Riley and Shurmer-Smith, 1988; Baudouin et al., 1997). Other port cities of the world were also reviewed through compilations of case studies on a global level (Carmona, 2003; Wang et al., 2007)
- The critique of the “Docklands syndrome” (Charlier, 1990, 1992, 1994b) based on the argument that old port areas may be redeveloped for new port uses rather than sole urban activities having no link with the specific character of the port city (Charlier and Malézieux, 1997). This approach can be grouped with the critique of post-modern waterfronts by Norcliffe et al. (1996) where consumption and leisure activities replace former industries;
- Investigations about the mechanisms of waterfront redevelopment focusing on policies and projects through comparative perspectives (Breen and Rigby, 1994; Jauhainen, 1995; Gordon, 1997; Marshall, 2001) as well as on the diversity of actors and planning visions, and the representations of residents, local actors, and community groups (see Hoyle, 2000);

DISCUSSION AND CONCLUSION

The wide scope of port city studies encompasses a large number of works throughout a variety of issues and methods from several social sciences. Although this review provides only a partial coverage, it clearly confirms that port-city research is very useful by providing concrete examples on the changing relations between material flows and local planning issues

of transport nodes (Hesse, 2010). However, other dimensions of urban development (e.g. air transport, knowledge-based activities) have placed port-related studies at the periphery of mainstream research, despite the continuous importance of maritime transport for the global economy. Contemporary transformations of port cities clearly put in question the symbiotic meaning of the port city (or cityport) concept, but some scholars have underlined cultural and economical permanencies in port-city interdependence. Perhaps, the main weakness of port-city research is to have privileged the functional and spatial separation process and its actors, leaving behind the evaluation of sustained linkages between port and city, at least empirically speaking. Access to disaggregated data has always been limited, preventing the measurement of how much important is the city for the port and vice-versa. For instance, we barely know the precise spatial distribution of ports' hinterland, and the proportion of flows generated and consumed by the adjacent city in total port traffic. Nor do we have detailed figures of such trends by commodity type and over time. Such data simply does not exist or should be requested at port and/or customs authorities of a given country. Similarly, data on the share of maritime transport in city's total trade (modal split) does not exist, although it is a crucial indicator to assess port-city interdependence. Only broad estimates are given by official statistics, with limited comparability from one port city to another. About the internal organization of port cities and waterfronts, there is a need for further interdisciplinary research to classify, after decades of redevelopment, various policies and models and their impact on urban development. To what extent have some waterfront redevelopments affected or boosted the city's economy? How did it diversify the functional profile of the city and attenuated its social inequalities? Which trends would a typology of waterfront redevelopment practices and outcomes reveal? This is where port-city research, by refining its questions and tools, should be engaged.

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TABLES AND FIGURES

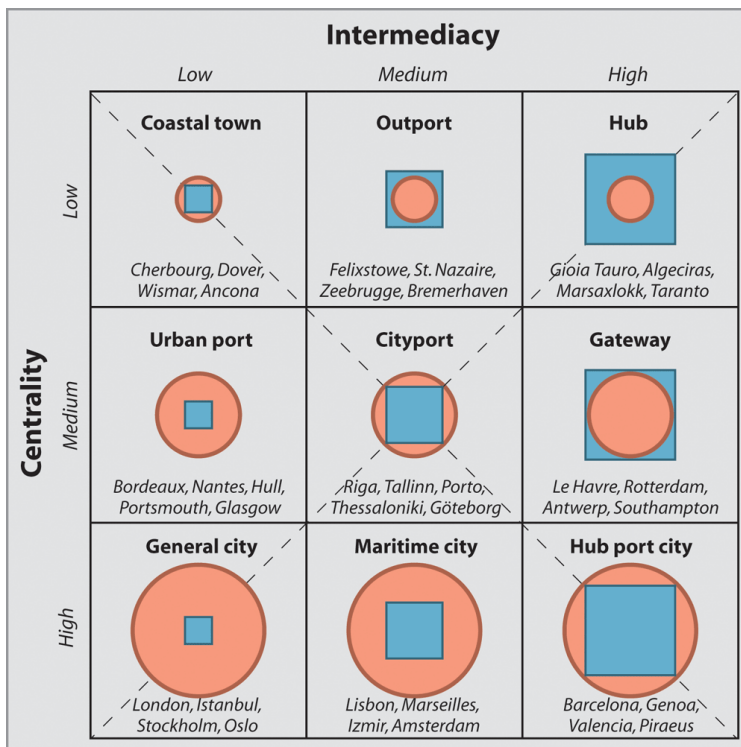
Table 1: Selected studies on economic development at seaports, 1958-2010

Author(s)	Year	Area	Agglomeration factors	Dispersion factors
Weigend	1958	General	Central location	
Bird	1963	United Kingdom		Technological revolution, congestion of the urban core
Taylor	1974	New Zealand	Containerization	
Bird	1977	General	Gateway functions	Central place functions
Vigarié	1979	General	Port-city interdependence	
Witherick	1981	Southampton	Multiplier effects	
Vigarié	1981	Europe	MIDAs, growth poles	
Vallega	1983	General	Indirect port-urban growth	
Stern & Hayuth	1984	Middle East	Traffic growth at remote ports	Lock-in effect of the inland core economic region
Brocard	1988	General	Long-distance relationships through sea lanes (foreland)	Competition between port city and non-port city
Kidwai	1989	India		New port construction
Hoyle	1989	Developed countries	Waterfront redevelopment	Port expansion, port-city spatial separation
Murphey	1989	Asia	Functional diversification of the urban economy	Loosening of port functions
O'Connor	1989	Australia	City size	
Omiunu	1989	Nigeria		Urban growth
Slack	1989a	Canada	City size	
Slack	1989b	Montreal, Hong Kong	Locational bound of port services in CBDs	Urban redevelopment, firm turnover
Wharf & Cox	1989	New York	Metropolisation	Changing commodity mix
West	1989	Developed countries	Amenity of the waterfront	High land rents
Goss	1990	General	Economies of scale	
Campbell	1993	General		Regional diffusion of economic benefits
Gripaios & Gripaios	1995	Plymouth		Port-city separation
Lever	1995	Europe		Wealth differentials
Fujita & Mori	1996	General	Economies of scale	Lock-in effect of already existing centres
Pesquera & Ruiz	1996	Developed countries	Tertiary development	Environmental impact
Gleave	1997	Africa	Spatial fix of CBDs	New industrial districts
Gordon	1997	Developed countries	Waterfront redevelopment	Low accessibility and social diversity of old port areas
Van Klink	1998	Rotterdam	Port network	Diseconomies of scale, subharborisation
Gripaios	1999	United Kingdom		Transport function decline
Dekker et al.	2003	Rotterdam	Direct & indirect benefits	Environmental impact & congestion
Langen de	2003	United States, South Africa, Netherlands	Ports as clusters of economic activities	
Rozenblat et al.	2004	Europe	Relative accessibility	Deindustrialization, unemployment
Van der Lugt & De Langen	2005	Asia	Export-led logistics	Import-led logistics
Notteboom & Rodrigue	2005	Developed countries	Corridors, extended gateways	Depolarization, decentralization
Ducruet & Lee	2006	World	Tertiary sector development	Urban growth, lack of space
Lee & Ducruet	2008	Hong Kong, Singapore	Global urban functions	Cross-border integration
Lee, Song & Ducruet	2008	Asia	Efficient planning policies	High rental costs at the CBD
Grobar	2008	United States	National economic growth	Regional negative impacts
Ducruet	2009	OECD	Service sector specialization	Industrial sector specialization
Jacobs et al.	2010a	World		
Jacobs et al.	2010b	World	Urban hierarchy	

Table 2: Selected examples of relevant levels for analyzing port-city relations

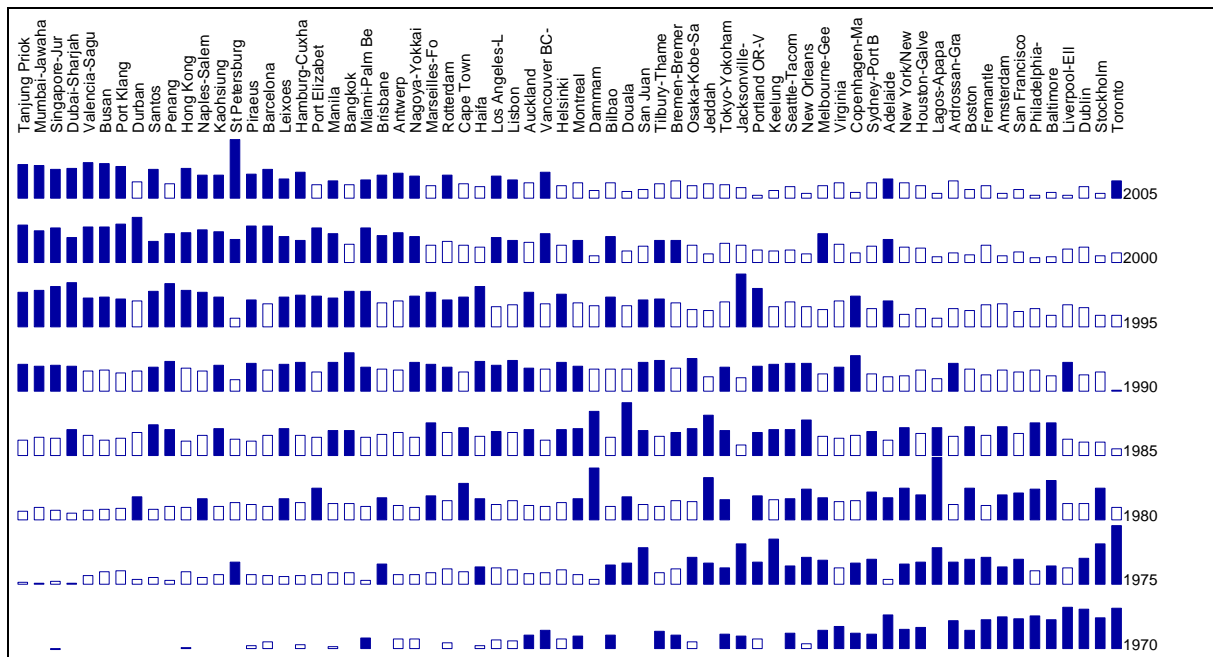
Author	Scale 1	Scale 2	Scale 3
Charlier (1988)	Local level <i>Fragmentation of urban spaces by the port</i>	Regional level <i>Growth pole strategy</i>	National level <i>Transport policy, regulation of competition</i>
Fabre (1992)	City level <i>Port specialization vs. Urban diversification</i>	City-region level <i>Port-related externalities for regional production networks</i>	National and international level <i>Weakened spatial fix, transit trade</i>
Bonillo (1994)	Port infrastructure <i>Architectural design</i>	Interface <i>Spatial and economic pressures</i>	CBD <i>Lack of space, complementarities</i>

Figure 1: A typology of port cities



Source: adapted from Ducruet and Lee (2006)

Figure 2: Trajectories of selected port cities, 1970-2005



Source: adapted from Ducruet and Lee (2006)

N.B. Height of bars represents the normalized concentration index of traffic share versus population share for each port city within its world region, and dark colours are attributed to values higher than rows' average