Spatial glocalization in Asia-Pacific hub port cities: A comparison of Hong Kong and Singapore

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SPATIAL GLOCALIZATION IN ASIA-PACIFIC HUB PORT CITIES: A COMPARISON OF HONG KONG AND SINGAPORE

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ABSTRACT

Business environment in which a port carries out its operation is increasingly reflected by intra- and inter-port competition on regional and global scales, resulting in port concentration and deconcentration. While a number of recent studies interpret those phenomena as impacts from global forces such as containerisation, little has been done about local forces such as the evolving relationships between urban policy and port growth. This paper proposes to compare how the two global hub port cities of Hong Kong and Singapore have sustained their port activities while transforming into major economic centres. Entropy indexes are calculated by district, based on service industries related to port activities between 1993 and 2004. Results show the spatial shifts of port-related activities stemming from simultaneous factors, such as port competition which affects the international position of Hong Kong and Singapore, and lack of space and congestion at the port-city interface. However, one main differentiating factor in the evolution of the two hub port cities is the varying impact of regional cross-border relations with mainland China and Malaysia.

Keywords: Hong Kong, Singapore, glocalization, interface, hub port city, entropy

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1. INTRODUCTION

In recent decades, the concept of globalisation has acquired a wide recognition among researchers. Notably, port and urban studies both show increasing concern about economic and spatial changes affecting seaports and port cities worldwide.

Recurrent trends such as industrial shifts within the world system between advanced and developing economies, and their consequences in terms of port concentration and competition among port regions have altered traditional patterns of port-urban linkages. As a result, many port cities stand "*among the most environmentally degraded cities in the world*" (OECD, 2004), while the symbiotic stage of the 'cityport' (Hoyle and Pinder, 1981) defined by port-city economic, cultural, spatial, historical interdependence and mutual benefits is increasingly put in question in a number of models and case studies. Technological changes in the maritime world and the port industry have led to shortages of available land for port expansion within port cities, and to a decline in port-related employment. In parallel, urban economies have undergone a double shift: spatially, industrial activities relocate from city centres to outer areas and, functionally, port-related activities become less important than more lucrative commercial and tertiary functions. This is indicated by developmental models in both advanced and developing economies (Hoyle, 1989; Murphey, 1989). Also, air transport has become a better indicator of urban radiance than sea transport in the study of global cities (Dogan, 1988; Keeling, 1995; Witlox et al., 2004).

However, due to the continued dependence of world trade on sea transport – more than 90% world trade volumes – port functions have mutated rather than disappeared. Some have relocated to more accessible and less urbanized sites, while others have been sustained at or nearby the original site. For example, the so-called 'hub ports' such as Hong Kong and Singapore have maintained an eminent and powerful position relative to other neighbouring ports. Such cities combine the attributes of both a global city and a hub port (Friedmann, 1988; Sassen, 1991; Ducruet, 2007a; Lee, et al., 2008). After a period of combined port and

urban growth driven by the globalisation of the industry, Hong Kong and Singapore are now confronted to severe challenges from their adjacent ports such as Shenzhen (Mainland China), and Tanjung Pelepas (Malaysia) respectively. Thus, understanding contemporary challenges in port-city relationships necessarily calls for an integrated approach, beyond the waterfront. Notably, the rise of new global players inserting cities, ports, and regions in global production networks is well analyzed in recent studies about the involvement of global terminal operators and ocean carriers in port development worldwide (Robinson, 2002; Notteboom and Rodrigue, 2005; Olivier and Slack, 2006; Jacobs and Hall, 2007). Yet, such analyses are restrained to maritime networks, transport corridors, and port areas, while the role of the urban space, or urban fabric, is either considered secondary or taken for granted by most economic and transportation geographers (Fujita et al., 1999). Indeed, ports are not only embedded in transport and supply chains, but also in urban economies and industrial areas that are regulated by different forces and regulations than in the transport business, such as urban governance, regional, national planning and industrial policies seeking to levy rents from footloose activities (Markusen, 1996). Therefore, great care must be inferred in isolating ports and supply chains from the urban and regional environments in which they develop. Networks - should they be global - owe their existence to complex territorial belongings in a globalized environment (Scott, 1988; Dicken, 2003).

The factors explaining the continued importance of port functions within global cities are not yet well understood. This may relate to some ‘exogenous’ advantages, such as advantageous geographical location and also to some ‘endogenous’ advantages, such as the efficiency of combining port development and urban management schemes and policies. Fleming and Hayuth (1994) propose a framework based on centrality and intermediacy to analyze transportation hubs, but this work is just focused on internal factors.

The aim of this paper is to analyze global and local factors affecting the evolution of port cities simultaneously. It proposes an analysis of the location patterns and evolving spatial

distribution and concentration of port service industries within the two hub port cities during the last decade. The study of such activities is interesting because of several reasons. First, port service industries share various functional linkages with port and urban activities. Thus, changes in the location of those firms may give useful evidence about broader issues of port and urban development on various levels. Second, despite the apparent spatial fix of those activities in waterfront sites or Central Business Districts, these generally small firms are very footloose and tend to seek lower rents (Slack, 1989; Lee, 2005). Although it is beyond the scope of this paper to document in detail the behaviour of individual firms, we believe that they provide as a whole a distinct and specific benchmark of the evolution of port-city linkages. Notably, the attractiveness of waterside areas for the urban redevelopment of formerly harbour areas into tourism, commercial, residential, and other functions is a major challenge for global port cities that are all confronted to lack of space and conflicting urban land uses, but this has not yet been consistently documented through comparative research or analyzed in relation with changing port and urban contexts and strategies, notably in Asia (Ducruet, 2006). This is indicated by recent studies showing that "worry about the decline of port business in Hong Kong has appeared widely" because of its changing role from a hub port city to a more diversified, less industrial and port-dependent global supply chain management centre (Wang, 2007). Empirical evidence from OECD countries confirmed the lower port performance of industrial regions compared with regions concentrating tertiary activities and GDP (Ducruet, 2007b).

A first section reviews some theories and cases or port-city interface evolution in the light of the concept of glocalization. A second section introduces Hong Kong and Singapore as two global hub port cities facing similar challenges. A third section compares the internal spatial changes within Hong Kong and Singapore between 1993 and 2004, by using entropy measurement that is calculated from moving pattern of port service industry location. The conclusion evaluates the benefits of the results for the study of spatial glocalization in the

case of port cities.

2. GLOCALIZATION AND PORT-CITY RELATIONSHIPS

2.1 Basic principles of port-city relationships

While a majority of studies has focused on port growth in the context of either developing (e.g. Taaffe et al., 1963; Hoyle, 1983; Wang, 1998; Slack and Wang, 2003) or advanced countries (Hayuth, 1981; Slack, 1994; Notteboom, 1997), they have remained relatively isolated from urban research that is more focused on urban redevelopment in post-industrialised port cities (Slack, 1989; Church, 1990; Breen and Rigby, 1994; Gordon, 1997; Marshall, 2001), appropriate treatment and performance of urban planners and civil servants (Fainstein, 1991; Wolman, 1994), and the wider scope of political issues in urban redevelopment (Savitch, 1988; Harvey, 1989). Thus, it is recognized that urban models have often neglected the relation between port activities and urban structure (Gleave, 1995; Ducruet and Jeong, 2005; Lee and Ducruet, 2006).

As synthesized by Ducruet (2007a) port-city relationships may be understood as a dichotomy between economic advantage and spatial constraint. The matrix of port-city relationships distinguishes different types of port cities according to the relative importance of those two aspects. For example, a transhipment terminal provides optimum nautical and landward transport accessibility, but it lacks of economic diversity locally and regionally, due to the distance from often congested urbanized areas, as in the pioneer Anyport model (Bird, 1963). This is also confirmed more recent studies: *"diseconomies of scale in some load centres emerge in the form of a lack of space for expansion and limited foreland or hinterland accessibility*" (Notteboom, 1997). Conversely, the general city provides a wide range of economic functions, but urban development has constrained port growth to such extent that modern facilities have relocated elsewhere together with seaborne traffics. The

cityport is a fragile stage of equilibrium that is likely to be disturbed by inefficient port/urban planning policies locally, and inter-port competition regionally (Ducruet and Lee, 2006). The global hub port city has the particularity to maintain high transport efficiency while transforming itself in a more diversified economic centre. There are, of course, increasing threats arising at every geographical level stemming from inter (or intra) -urban and inter (or intra) -port competition, but also depending on the management and planning of the port-city interface.

2.2 The port-city interface: a 'glocal' place?

As hinted by Hayuth (1982), the port-city interface is an area in transition between different functions. This paper considers this interface also as an area of transition between different geographical scales. Although it has been recognized that the port-city interface is a unique area due to the mingling of various influences, the ongoing mechanisms have not yet been explained precisely. For this, we use the concept of glocalization, first introduced in the 1980s by Japanese economists and defined by Robertson (1997) as the "simultaneity – the co-presence – of both universalizing and particularizing tendencies". Glocalization also embraces the economic rationale of global firms that are willing to adapt their products to a local market and extend outsourcing to global market in order to catch more markets and reduce producing cost. In sociology and anthropology, glocalization is also used though it is similar to synchretism, i.e. the absorption and transformation of external influences by local communities resulting in enriched culture and strengthened identity (Friedman, 1999). Geographers such as Brunet (1993) and Durand et al. (1996) have acknowledged that a transcalar interpretation of spatial phenomena is more valuable than either mono-scalar or top-down/bottom-up approaches. Spatial systems are built through transcalar dynamics (St. Julien, 2000), and characterized by asymmetric networks rather than proximity factors

(Pumain, 1995).

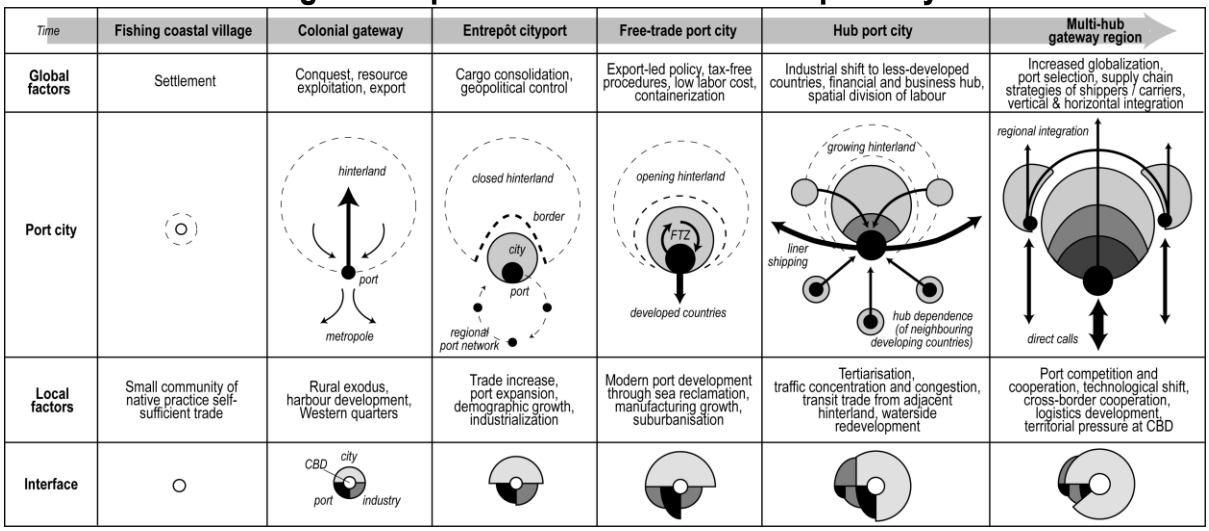
In the case of port cities, the cosmopolitism offered by their maritime identity has provided a fertile ground to study such topics (Cartier, 2000). However, while the conceptual shift from port-city interaction to global-local interaction has become explicit in a number of recent studies (Riley and Smith, 1988; Hoyle, 2000; Frémont and Ducruet, 2005), scholars have not yet provided a coherent framework to analyse such phenomenon. Earlier works recognize the importance of ports as pivotal functions between land and sea networks (Vigarié, 1968). More recently, De Roo (1994) defines port cities as the most accomplished laboratory to study the multi-fractal mechanisms of geographical space, because nowadays the sustainability and efficiency of port cities are better represented by their ability to connect different scales than to increase their traffics.

Figure 1 is provided as a synthesis of the principal mechanisms affecting the port-city interface at different developmental stages. As an area of overlapping port and urban growth, which occur spatially but also in nature (e.g. tertiarization), the port-city interface is constantly being transformed not only physically and aesthetically, but also functionally. The original symbiosis of the initial stage is transformed into a physical barrier following the period of internationalisation, with less accessible waterfronts due to trunk road multiplication along the urban shore. This physical barrier could have been overcome with the planning of tunnels and suspended highways allowing trucks accessing the port / the outskirts of the city.

However, in many cases, the physical barrier has not been transformed sufficiently and has participated increasing global pressures on the local spatial system. Thus, the shift of port facilities from the interface is relayed by the shift of urban functions to the interface, as seen in several waterfront redevelopment cases because of higher rents (West, 1989; Lee, 2005). As a result, the node looses its port function to the advantage of urban functions, while the former interface disappears and is replaced by a more radical spatial and functional

disrupt between port and city. However, port and city continue to exist independently in proximity with each other while enlarging their respective importance. Therefore, there is a subtle difference between declining and refining in the model. In many cases, the apparent decline of the port on a micro level (i.e. the city centre) is in fact hiding the wider redistribution of port and urban functions across the metropolitan area or city-region. This indicates to what extent most studies of waterfront redevelopment have largely ignored the fact that not only the city but also the port has regenerated through spatial relocation while keeping close ties with the neighbouring urban area, though less visibly.

Figure 1: Spatial evolution of the hub port city



Source: own realization

3. HONG KONG AND SINGAPORE IN THE ASIAN CONTEXT

3.1 Two dynamic port cities of Pacific Asia

Origin and development of the hub port cities

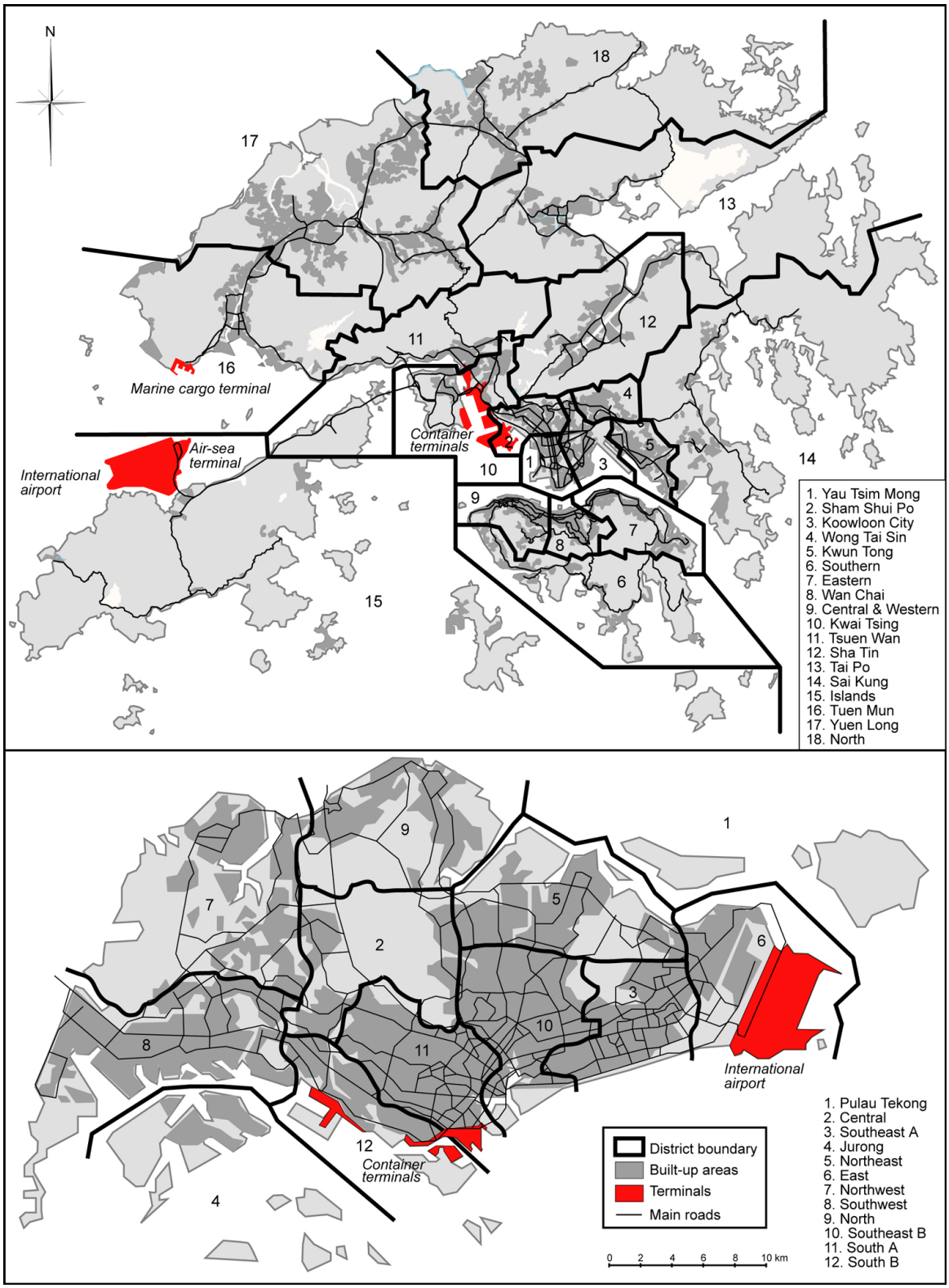
Hong Kong was initially established in 1843 by Britain. As a city-state within the capitalist market world, Hong Kong had no choice but to develop its own export-oriented economy. The city was changed further from a simple entrepôt into an export-led manufacturing base due to the influx of rich entrepreneurs who chose to leave China due to

political instabilities in 1940s (Wang, 1998). If Hong Kong shares similar organisational characteristics with other industrializing countries of the 1960s and 1970s, based on well-established financial, institutional and legislative settings, the success of Hong Kong's container port in the 1980s is the successful business strategies and efforts of private companies, based on the *laissez-faire policy* of the government.

Singapore was initially established in 1819 as a trading port for ships plying their trade between Europe and East Asia. With the development of rubber plantations and tin mining in Malaysia, Singapore's ports were strengthened and consolidated, witnessed by an eight-fold expansion of trade between 1873 and 1913. Singapore gained its independence in 1965. Since then, though manufacturing has taken over as the main economic pillar, the role of the city-state as a transportation hub has not withered but expanded because of its strategic geographical position and well-developed supporting infrastructure. Since the setting up of the first container terminal in 1972, another avenue for the local economy to advance from its baseline of traditional entrepôt has been opened up: "With the competition and technology that came with containerisation and building of faster ships with a more economical use of fuel oil, shipping lines are using larger ships over greater distances" (Port of Singapore Authority, 1983, p.13). These trends have stimulated the development of port functions in Singapore, as well as its continued role as financial centres.

Although population density in urbanised area of Hong Kong is significantly higher than that of Singapore as shown in Table 1, both cities attract higher volumes of foreign direct investment than any other Asian countries, except China. Hong Kong and Singapore play an important role in localisation and globalisation processes, notably through the attraction of numerous headquarters of MNCs with enormous capital. These similarities might be explained by their geographical advantages, legal social systems and friendly business environment, as well as a similar ethnic Chinese business culture.

Figure 2: General layout of Hong Kong and Singapore



Source: own realization, modified from various sources

Yet, Hong Kong and Singapore offer contrasting responses to similar challenges in terms of respective policies regarding immigration control and ethnic diversity (Skeldon,

1997), industrial restructuring (Chiu et al., 1996), cross-border integration (Ho and So, 1997; Fau, 1999; Grundy-Warr et al., 1999; Shen, 2004), real estate development and planning mechanisms (Ng, 1999; Haila, 2000; Han, 2005), and state intervention in the economy (Lam, 2000). While such considerations are beyond the scope of this paper, they provide useful benchmarks allowing a better understanding of similarities and differences between the two hub port cities in terms of port-urban dynamics.

Table 1: Summary statistics on Hong Kong and Singapore (2005)

Categories	Hong Kong	Singapore
Population (million)	7.0	4.3
Size (km^2)	1,098	682
District (no.)	18	12
Total density (person/sq. km)	6,096	4,965
Urban density (person/sq. km)	21,436	11,968
Urbanized areas (%)	15	50
GDP per capita (USD)	25,760	26,870
Foreign Direct Investment (USD million)	18,009	10,800
Container throughputs (million TEUs)	22.6	23.2
Distance between CBD[a] and Port (km)	4	3

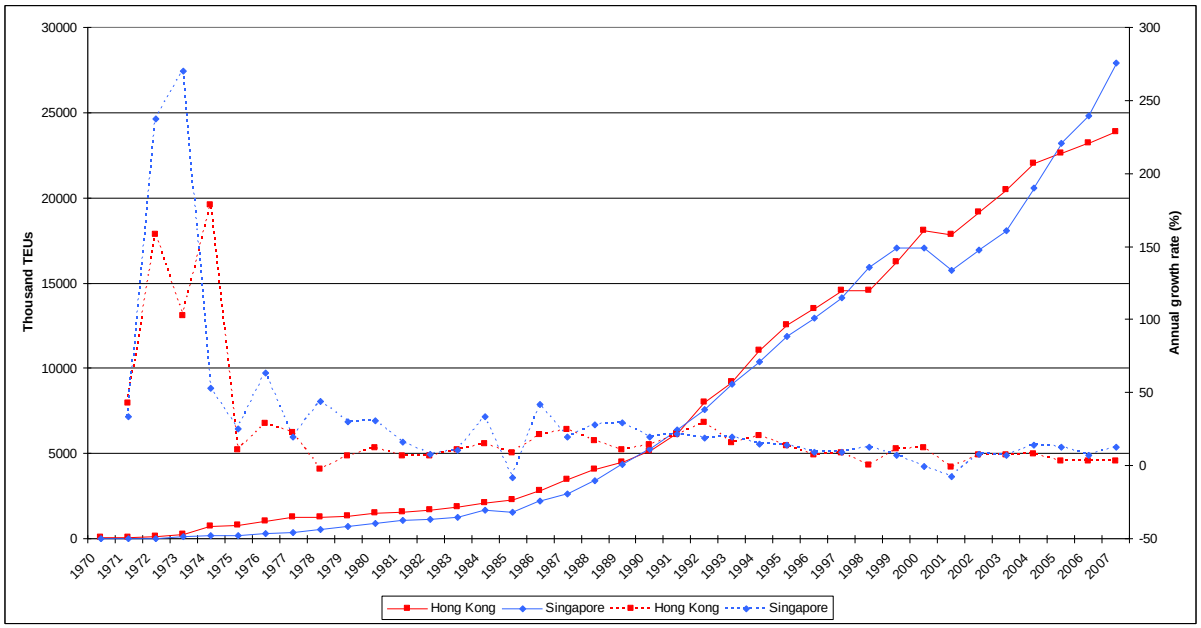
Sources: Census and Statistics Department, HKSAR (2006); Singapore Department of statistics (2006)

Port and urban growth

Turning to the port sector, and as two of the "Asian Dragons", Hong Kong and Singapore have been the world's busiest container ports over the last years, with continuously increased traffic as shown in Figure 3. In both cases, traffic growth has been very rapid and tremendous, such as the 600% increase in Hong Kong between 1985 and 1995. Figure 3 also shows that after a first stage following the opening of respective container terminals (1970-1985), Hong Kong's growth has been more important than in Singapore, probably owing to its role as an export platform for Chinese manufacturing goods that are produced in the adjacent and growing hinterland. However, a second stage (1985-2000) shows that Singapore's port growth has been more rapid than Hong Kong's growth. After 2000, the traffic growth of container cargoes is slower in Singapore than in Hong Kong but since 2004

Singapore has surpassed Hong Kong.

Figure 3: Container cargo throughputs in Hong Kong and Singapore, 1970-2007 (Unit 1,000 TEUs)



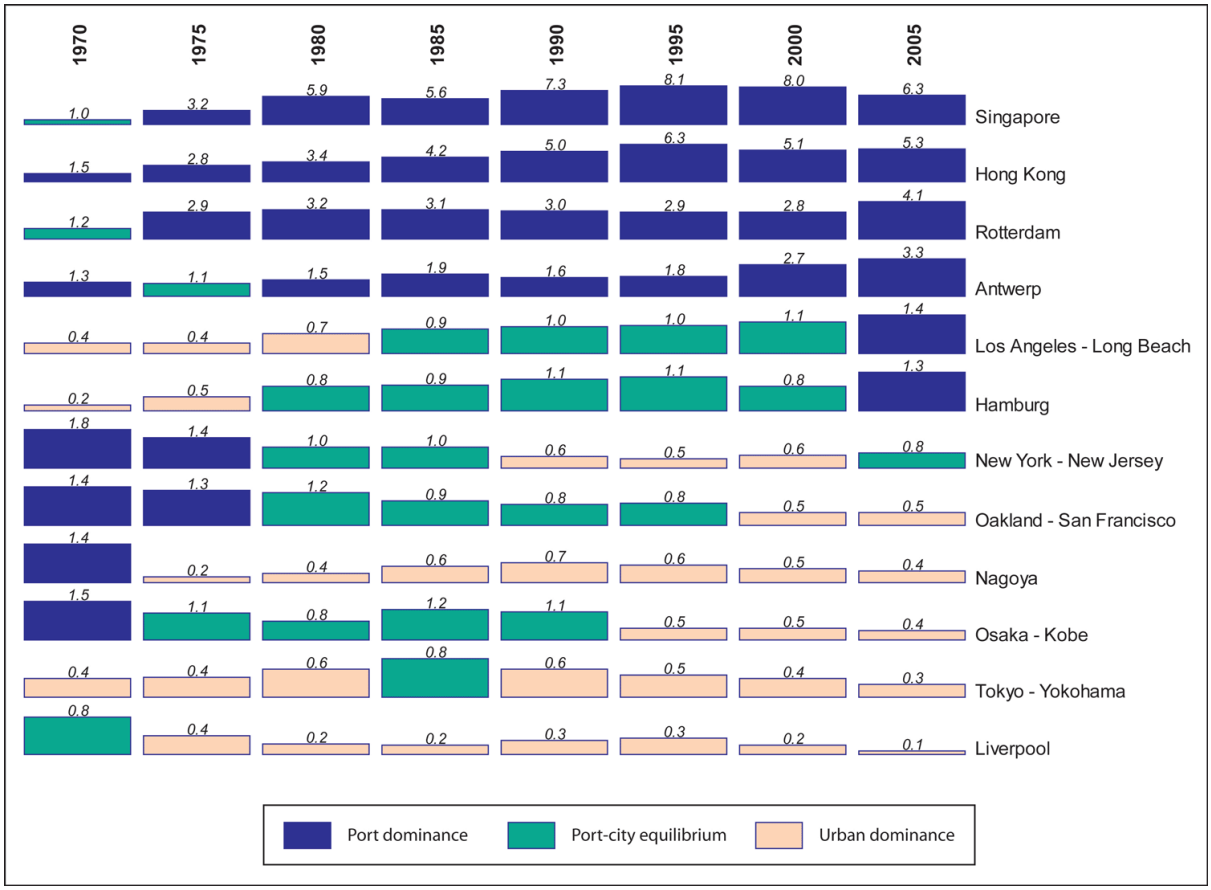
Sources: own realization based on Containerisation International Yearbook (various years)

In terms of port-city relationships, Figure 4 compares the port-city relative concentration index of a number of global port cities between 1970 and 2005, of which Hong Kong and Singapore. This index represents a first methodological step into the international comparison of port-city evolution (Ducruet and Lee, 2006). It expresses in a single value the complex mingling of various phenomena such as local and urban growth or decline, internal pressure at the port-city interface resulting in traffic congestion and lack of space, and regional competition among ports and urban centres simultaneously. Its calculation is similar to location quotient, by dividing the port city's share of total regional container traffic among port cities, by the port city's share of total regional urban population among port cities. Urban population was counted based on the morphological extension of urbanized areas in order to avoid comparing different statistical spatial units, while port regions were adapted from *Containerisation International* definitions. It shows that the two hub port cities have a

comparable evolution compared with other major port cities such as Rotterdam, Antwerp, and Los Angeles-Long Beach.

Despite their large populations, they keep very high traffic concentrations, while other major port cities have faced the relative demise of their role as ports regionally, notably in Japan, New York, Oakland, and Liverpool. However, the slight decreases in Hong Kong and Singapore since 1995, although concentration values remain high, may indicate the ongoing transformation of the two global hubs into more general port cities. More than in other cases, the proximity of port installations to Central Business Districts (CBDs) is a common pattern with colonial port cities (McGee, 1967) that is difficult to overcome in terms of cargo flows' fluidity and logistics costs. Therefore, a more detailed analysis of the internal aspects of glocalization is needed.

Figure 4: Relative port-urban concentration at selected port cities, 1970-2005



Source: own realization, adapted from Ducruet and Lee, 2006

3.2 New port and urban challenges

Port planning and port competition

For Hong Kong port, China's reforms and modernization since the late 1970s is both an opportunity and a challenge. On the one hand, the relocation of Hong Kong's labour-intensive, export-led industries, and the spread of its largest container terminal operator, Hutchinson Port Holdings (HPH) to south China conferred to Hong Kong the "ability to capture containerized cargoes from the rapidly industrializing Pearl River Delta [and] to delay the possible decline of [its] world hub position" in a context of tense competition with northeast Asian ports (Loo and Hook, 2002, p. 235). As a matter of fact, re-exports from China constitute nothing less than 40% of Hong Kong's international trade in early 2000s (Song, 2002). On the other hand, traffic concentration and productivity growth led to rising costs and congestion in Hong Kong since the 1990s, due to political tensions causing important delays in new terminal construction locally and rail freight expansion with Chinese provinces. Despite the importance of the port in the local economy, and the relatively low cost of achieving modal shift from road to rail, Hong Kong's port policy virtually accentuated this situation through the realization of a River Trade Terminal in 1999. It seems that port expansion in Hong Kong is constrained by Chinese interests in developing mainland ports, as a means to increase their attraction of direct liner calls and reduce their dependence on the Hong Kong hub (Song, 2002). In addition, the lack of efficient railway access to Hong Kong port terminals as opposed to recent efforts in railway connection of south Chinese ports for containerized cargo has become a real threat for sustaining its position regionally and its gateway status on a continental level (Loo and Hook, 2002). Limited land availability for new port and storage site expansion in Hong Kong also explains this situation, although more than 10 million square feet of logistics activities were built in the mid-1990s for housing freight consolidators in close physical proximity with port terminals (Cheung et al., 2003). This was

undermined by increasing rents in central locations, deficiencies in planning regulations in the New Territories, and a lack of local planners' awareness about space requirements for empty containers around port terminals, resulting in haphazard storage across rural areas (Bristow et al., 1995). While Shenzhen ports have a "psychological and administrative advantage in that there are no border crossings involved in using the Shenzhen ports as opposed to the port of Hong Kong [and] using Hong Kong as a hub for China is not without its problems and costs" (Cullinane et al., 2004, pp. 48-49), cumbersome regulations and tight truck traffic at the border reinforce congestion in Hong Kong (Wang, 1998).

In the case of Singapore, there is a dearth of studies about the role of the different players involved in port competition regionally. Among existing ones, Mak and Tai (2001) notice that Malaysia's port policy "although not explicitly contained in any official document" (p. 199), aims at reducing Malaysia's institutionalized reliance upon Singapore through the development of Port Klang as the national load centre, and of Tanjung Pelepas as the regional transhipment centre or hub port. This is true in the case of Malaysia-Singapore relations, since "Malaysia has always aspired to challenge Singapore's domination as the major cargo hub in the Malacca Strait" (Chang, 2002, p. 111). The first competitive action from the Malaysian government occurred in 1993 with the privatization and development of a new container terminal at Port Klang. Despite cargo handling charges 3 to 4 times cheaper than in Singapore, this action fell short reducing Malaysia's hub dependence, notably given the continued technological improvements of Singapore port and the corporatization of Port of Singapore Authority (PSA) in 1997 as a means achieving greater efficiency. The construction of Tanjung Pelepas (PTP) in southern Johore during the 1990s ultimately provoked in 2002 the shift of Maersk Sealand and Evergreen, two of Singapore's largest clients, to the new Malaysian port, causing a loss of not less than 10% of containerized cargoes, and allowing PTP gaining "access to Maersk's port-operating processes and technologies" (Leong and Chen, 2004, p. 8). Behind port competition is the unwillingness of

PSA to provide dedicated terminals to shipping lines, in order to both multiply port users and avoid costly terminal construction near the CBD, but this "discouraged the maximum use of port resources in land scarce Singapore" (Leong and Chen, 2004, p. 10).

Port growth and urban planning

As identified by Bristow et al. (1995), recent trends in Hong Kong's port-related planning issues may be summarized as a shift in the centre of gravity from the core area, where reclamation policies tend to privilege commercial functions while redeveloping old airport areas; to the periphery, especially through implementing efficient transport corridors to the new airport, the northwest, and the Chinese border. These orientations illustrate the shift from export center to world city as emphasized by Taylor and Kwok (1989). They particularly show how difficult was for Hong Kong government to convince the private sector developing areas remote from the urban core since the 1960s. Although private interests tend to dominate urban governance in Hong Kong, the government "has maintained strong control over land supply and development" (Ng, 1999, p. 13), notably through reducing economic concentration at the CBD: airport relocation, British military land removal, subway and tunnel development from the CBD to the New Towns. While the tertiary sector tended to remain in the CBD, the Territorial Development Strategy was relatively successful in allowing space-demanding industrial activities to shift to outer areas in a context of manufacturing growth, but this often led to "land use conflicts (…), greater competition for space, intensification in the use of land and infrastructure, changes in the need for facilities and services" (Taylor and Kwok, 1989, pp. 319-320). Due to increased pressures from China, the democratic transition from market-oriented urban planning to social-oriented urban planning may be delayed (Ng, 1999).

In the case of Singapore, a similar core-periphery dualism occurs along the same period that marks the evolution of the city-state into a global city. Lack of available land for

port and urban expansion, and high land prices forced the government to apply efficient urban planning policies by "constraining industrial development in specific zones and equipping the city-state with modern transportation infrastructures" (Rodrigue, 1994, p. 57). Notably, "land size constraint was and continues to be a major problem in Singapore's development" (Han, 2005, p. 76) although it continuously expands through land reclamation from the sea. This led to increased land use densification and urbanization throughout the national territory, but also to the relocation of labour-intensive industries through efficient and low cost multimodal transportation system connecting outer areas such as Riau Islands (Indonesia) and Johor State (Malaysia). Such policies occur in a context of the 2001 Concept Plan aiming at enhancing the quality of life in Singapore; they are highly controlled by the government, which owns 70% of the land in Singapore. Through the Master Plan Committee, all several implementation agents[3] and may acquire private land through the Land Acquisition Act (Ng, 1999). This constitutes an important difference with Hong Kong, where private interests are more influential. Notably, industry estates and development sites are developed by the Housing Development Board and by the Jurong Town Coroporation respectively (Lam, 2000), while land acquisition laws "made it possible to expropriate land for development and redevelopment" (Haila, 2000, p. 2245).

4. GLOCALIZATION PROCESSES IN HONG KONG AND SINGAPORE: ENTROPY EVOLUTION (1993-2004)

4.1. Data collection and methodology for Entropy analysis

By using data of location and number of firms related port industry of "International Standard Industrial Classification (ISIC)", we propose to highlight the spatial interdependence between port activity itself and port-related industries, from the early 1990s

[3] For instance: Urban Redevelopment Authority, Housing and Development Board, Jurong Town Corporation, Port of Singapore Authority, and Public Works Department.

to the early 2000s. The data used for Hong Kong and Singapore (1993-2004) includes port-related businesses per administrative district on the official administrative maps. It is important to underline the unchanged area units along the study period in both port cities.

As port-related industries combine several different activities, it is difficult to address a single definition of this sector, apart from the obvious connection between port activity itself and the other industries using the port. Basically, the "port industry" includes the loading and unloading of goods in a harbor area, but it can be enlarged to the whole logistics chain (including production, forwarding and storage) concerned with the goods carried by ocean vehicles (MOMAF, 2002). Given the slight differences between Hong Kong data (HSIC) and Singapore data (SSIC) detailed categories based on International Standard Industrial Classification (ISIC), as showed in Annex 1, a few data is excluded from the data sets in order to make the data comparable and to prevent any confusion in the analysis of the port cities.

Concentration Index is an efficient tool to check the spatial and functional change occurring at the port-city interface. Thus, the location change related to port industry will be measured using Entropy technique as one of other concentration indexes. Entropy is an appropriate inverse concentration measure (Clarke, 1985): the higher the entropy, the lower the degree of concentration and vice versa (Theil, 1967). The entropy measure (denoted 'E') is the expected information content which can be observed as the total of the information content of each event weighted by the respective probabilities (Sen, 1973).

This index weighs market shares by log (1/ y_i) and then sums them as follows:

$$E = 0.5\sum_{i=1}^{n} y_i \log\left(\frac{1}{y_i}\right) \quad \text{and} \quad y_i\left(\sum y_i = 1; y_i \geq 0\right) \qquad \text{Equation (3)}$$

where n is the number of districts, y_i refers to the shared of *i* th district in the total port

industries of the city.

If all the n districts have an equal share, then E= log *n* (maximum E value given *n*), and concentration is at a minimum. In contrast, E = 0 (minimum E value given *n*) when one district has all shares and takes the monopoly case (maximum degree of concentration). When the number of districts increases, while all remain of the same size, the E log *n* also increases. This is in accordance with the decreasing degree of concentration. The numbers equivalent to equal-sized districts with the same value of E (see Equation 3) is m = antilogarithm of E (De and Park, 2003). Clarke (1985) suggests the adjusted E in order that it falls in the interval of <0, 1> is an appropriate way to facilitate a comparison among cases. This is done by forming a relative measure of Entropy: E´=E / log (*n*). In this context, De and Park (2003) also apply the measurement to their study related to container port system concentration.

4.2 Entropy evolution in Hong Kong and Singapore

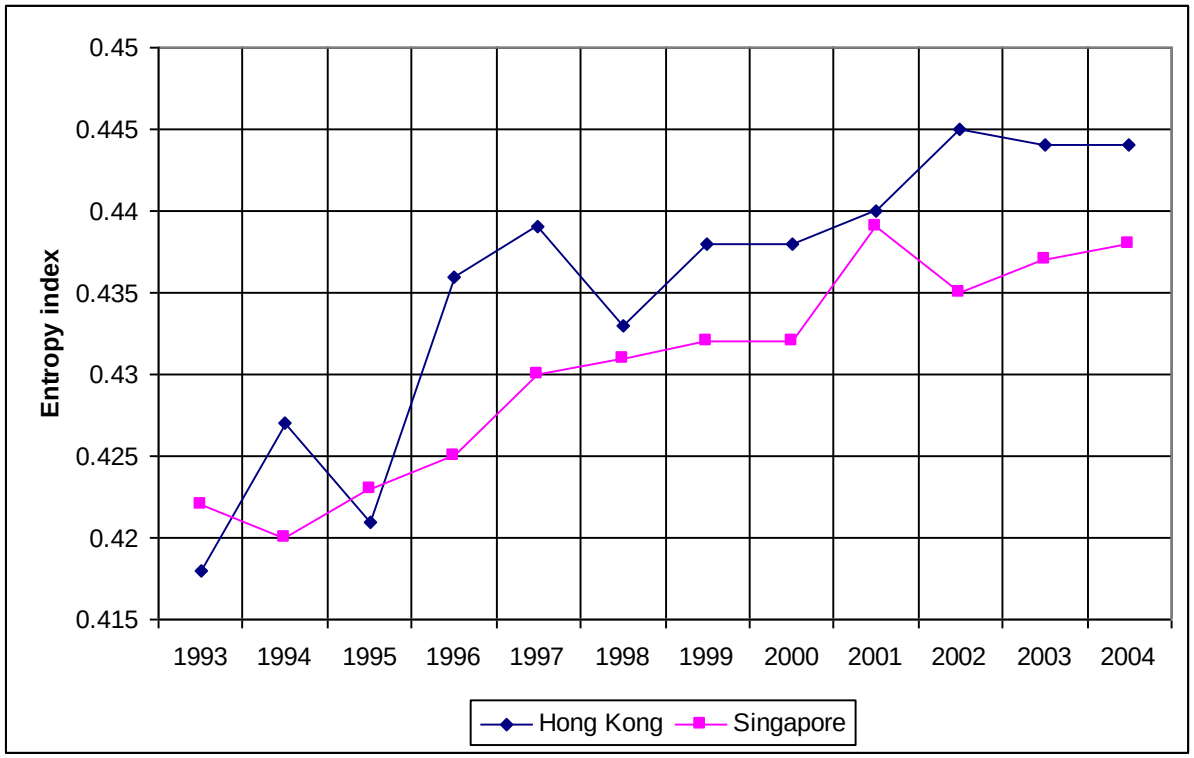
Main results of Entropy measurement are provided in Figure 5, and detailed results are provided in Annexes 2 and 3. The concentration of port-related firms reveals two interesting sets of phenomena for the two port cities. Each set of phenomena is explored as common trends or important differences in the two port cities' evolution.

A shift from centre to periphery

In Hong Kong, the degree of concentration has declined since 1993. It can be explained by the fact that Hong Kong has faced both space limitation locally, and the relocation of its port industry caused by the competition from Shenzhen regionally. In addition, notable numbers of port facilities moved from its main base Kwai Chung to the remote Tuen Mun (River Terminal), and many firms engaged in container storage have shifted to the New

Territories, an area close to Shenzhen border as part of the effort to reduce rental costs and secure wider space.

Figure 5: Port industry entropy in Hong Kong and Singapore, 1993-2004



Source: own realization

In Singapore, the degree of concentration has slightly become lower than that of Hong Kong. It can be explained that Singapore has been also facing space limitation, traffic congestion and the relocation of its port industry seeking lower costs, notably in Tanjung Pelepas (PTP), but this cannot be verified in the results as this is a Malaysian port located outside of the study area. Also, a number of port facilities have moved from the original and main base in the South (e.g. Tanjung Pagar, Pasir Panjang, and Telok Blangah) to the remotely located Jurong Island (nearby PTP) and Southeast (Changi airport). Such trend to the southeast can be explained by the challenge from competition with PTP in Malaysia, the opening of Jurong port, and the increasing demand in Sea & Air cargoes since 1995. According to PSA (2003) statistical data, the annual average growth of Sea & Air cargoes is

above 15% since 1995. In both maps, there is a clear trend of centre-periphery shift of port-related activities. The traditional port-city interface has faced enormous pressures stemming from global insertion, regional port competition, and local lacks of space resulting in congestion, and high rental costs. However, while the original factors explaining the shift of port-related activities are quite similar in both port cities, the spatial pattern of glocalization shows considerable differences. If our main findings are in line with Slack and Wang's (2003) work in terms of port evolution, this analysis brings some new evidence on port and port-city evolution. In particular, we underline the evolving relation between port back-up areas' expansion and port industry location, interpreted as an effect of glocalization upon location pattern, in terms of spatial dispersion.

Cross-border competition and cooperation

As showed in Figure 6, the spatial evolution of Entropy measurement does not lead to similar patterns. Although congestion and lack of space may be the same factors locally to explain the shift of activities, the role of the border districts is totally different in Hong Kong and Singapore to accommodate such changes, since "unlike Hong Kong, Singapore does not have an economically benevolent hinterland" (Lam, 2000, p. 399). Thus, our results also confirm the contrasted functions of the two port cities, with a higher importance of centrality and gateway functions in Hong Kong compared with Singapore, where intermediacy and hub functions dominate.

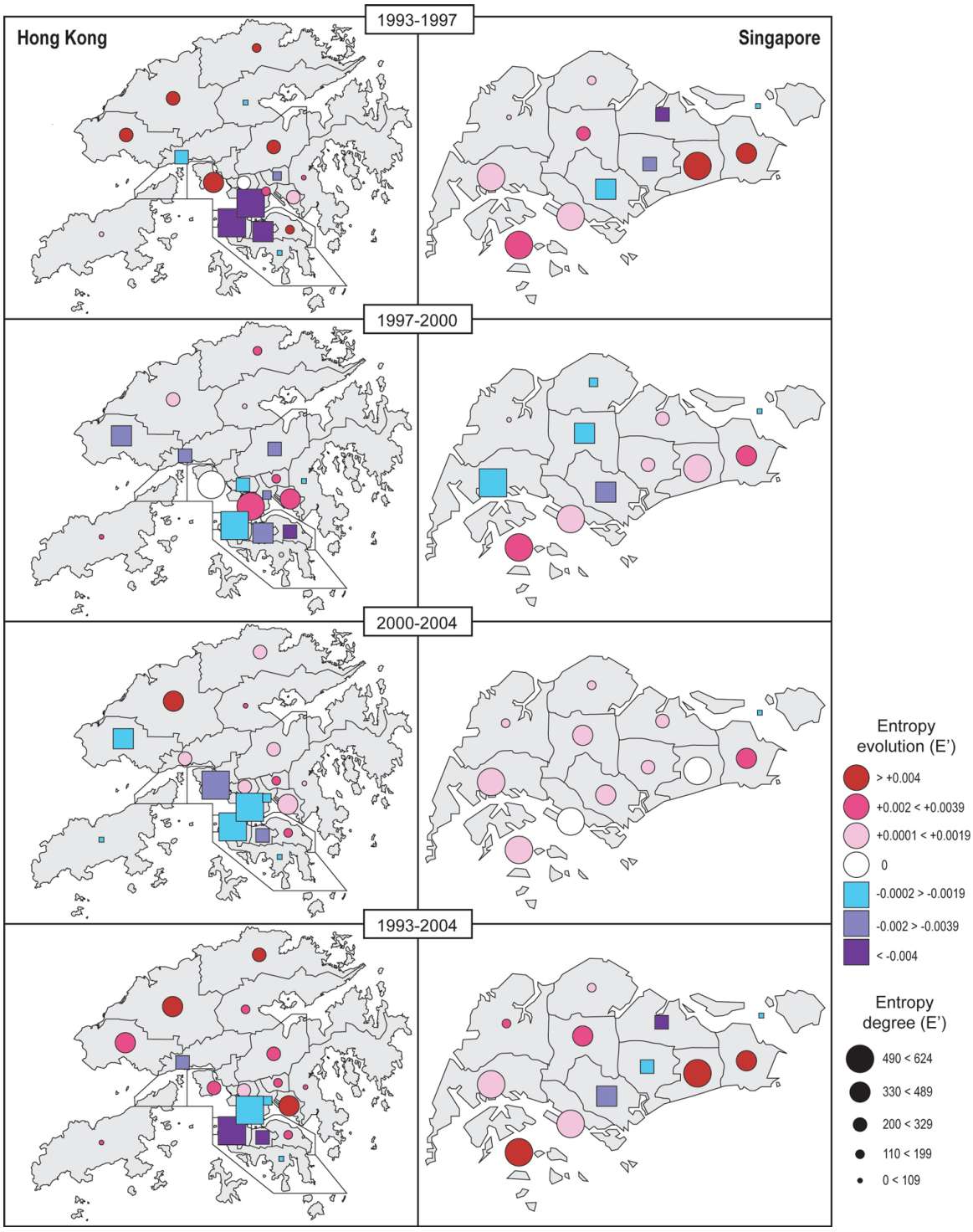
In Hong Kong, it is clear that global and local changes have found in the new relation with adjacent Chinese areas a good compromise to rethink the territorial layout of the hub. Not only Chinese transit trade by truck through Hong Kong has diminished due to gradual modal shift from road to barge, but also the betterment of relations between Hong Kong and China since 1997 has allowed more cooperation among respective ports and transport industries. The transport chain linking Hong Kong to its hinterland is getting more integrated

and intermodal than in the past. Also, the border does not have the same significance than before 1997. Hong Kong firms that are willing to locate closer to the border are allowed to do so by the government. Thus, there are incentives to promote the development of border regions which were restricted until then. Thus, Hong Kong is not anymore an island but a gateway to Chinese mainland economies. However, it is also a result of the illegal use of agricultural areas in the New Territories, illustrated by the development of illegal container staking areas (Hong Kong Port and Maritime Board, 2000).

Conversely, maps show to what extent Singapore is still an island in terms of transport activities and transport development. The border with Malaysia may be crossed daily by thousands workers, still the evolution of Entropy measurement does not show a sign of regional integration because port-related activities tend to locate as far as possible from the Malaysian border, i.e. Northwest and North districts. This can also be explained by a more important impact of the international airport than in Hong Kong in terms of cargo handling firms' attraction. Also, the Southeast shift, the more important land reclamations in Singapore than in Hong Kong may have accentuated the comparatively low impact of border districts on Entropy change. One important reason to explain the difference in firm spatial behaviour may be the different planning policies of the two hubs. While cross-border activities get enlarged in Hong Kong due to hinterland expansion, many port-related companies in Singapore are based on government capital and locate in huge Free Trade Zones and business parks that locate southern along the so-called *technology corridor*, such as industrial parks (e.g. International Business Park, Changi Business Park, and iHUB in Jurong East), and several logistics parks (e.g. Airport Logistics Park of Singapore, Toh Guan, Toh Tuck, Clementi West, and Changi International). This confirms previous studies showing the lower level of cross-border integration for Singapore than for Hong Kong, stemming from historical legacies, agency, and the structure and direction of integration (Ho and So, 1997). Singapore is not yet a hinterland port, but it is strengthening its hub functions through government incentives and

well-prepared service. Thus, although causal factors to explain the deconcentration of transport functions in two global hub port cities are very similar, the results differ considerably, shifting the study from economic to political geography.

Figure 6: Entropy degree and change by district, 1993-2004



Source: own realization

5. CONCLUSION

This paper attempted to examine how two major port cities in Asia respond to change according to their local, regional and global environment. After a brief review of their specific background, some evidence is brought from an analysis of spatial change occurring at the port-city interface. This area appears to be a relevant field for studying the capacity of port cities to integrate endogenous and exogenous factors, based on the concept of glocalization, in a sustainable manner. Moreover, our analysis focuses on port-related industries that lie at the core of port-city functional relationships. In particular, this research confirms the role of differing factors thanks to the Entropy measurement based on port-related activities.

Most of all, similar exogenous factors did not lead to identical effects on the port-city interface in the two places. The growth of container traffic is higher for Singapore, which shows a relatively stable concentration of port industry within the interface; it is more regular and stable for Hong Kong, what hides important shifts in port-related activities from the interface to outer areas. It means that Hong Kong has undergone more serious changes than Singapore, in terms of port peripheral challenge (Shenzhen) and hinterland expansion.

The changing pattern of Hong Kong's port-city interface is a reflection of its changing role at a regional level, by shifting value-added logistics activities such as consolidation, labelling, processing and so on, without the old core and keeping higher value-added activities such as retail, banking and finance, which are much less freight-generating and may strengthen its rank among Asian and global urban systems.

If the port function did not really affect Hong Kong in becoming a global city, it is more the new opportunity for both port and city to enlarge their continental radiance on mainland China which is the key to understand our results. Hong Kong can now develop not

only as a hub or as a gateway, but also as a central place in the urban system of Guangdong province, hosting the headquarters of numerous MNCs whose branches locate mainland.

Even if Hong Kong and Singapore have often been put in the same category of cross-border metropolises, that means a specific ability to overcome their separation from mainland structures by developing hub and informal networks, the continuous lack of continental continuity for Singapore explains why the spatial evolution of its port-city interface has been so different from Hong Kong's case.

In fact, the two places have transformed from port cities, to city ports and then to hub port cities, but the last stage illustrated by our results might pave the way towards a continuation for Singapore and a rupture for Hong Kong. It does not mean that Hong Kong's port and logistics performance gets lower because of wider urban centrality and industrial shift, but in relative terms the port function as a whole may appear lower in Hong Kong's economy in terms of employment and revenue over time, while it is maintained high in Singapore.

In this respect, our comparison offers a basis for further investigation in order to deepen the understanding of the interaction between urban planning and port development in the light of glocalization processes. In practical terms, this will be done by further examining the cases of Hong Kong and Singapore, as well as other Asian hub port cities (e.g. Busan, Kaohsiung, Shanghai), and also by adapting our methodology to the ever-changing port environment in this region (e.g. China impact, Post China impact).

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Annex 1: Classification of port service industries in Hong Kong and Singapore

Hong Kong (HSIC-Sector 7)	Singapore (SSIC-Sector 6)
Ocean and coastal water transport (714)	**Ocean and coastal water transport (633)**
Ship agents and managers	Ship agents and managers
Ship owners of sea-going vessels	Ship owners of sea-going vessels
Operators of sea-going vessels	Operators of sea-going vessels
Supporting services to water transport (716)	**Supporting services to water transport (633)**
Container terminals, haulage of containers and container leasing	Container terminals, haulage of containers and container leasing
Services incidental to transport (718)	**Services incidental to transport (633)**
Sea cargo forwarding services	Sea cargo forwarding services
Shipbrokers	Shipbrokers
Packing and crating services	
Cargo inspection, sampling and weighting services	Cargo inspection, sampling and weighting services
Storage (721)	**Storage and warehouse (631)**
Cold Storage	
General cargo warehouses and other storage services	General cargo warehouses and other storage services

Note: ( ) are index numbers of main industry sectors
Sources: Employment & Vacancies Statistics: Hong Kong: Census and Statistic department (2005); Singapore Industrial Standard Classification: Singapore Department of Statistics (2006).

Annex 2: Evolution of entropy indexes in Hong Kong and Singapore, 1993-2004

Port city	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Hong Kong	0.418	0.427	0.421	0.436	0.439	0.433	0.438	0.438	0.440	0.445	0.444	0.444
Singapore	0.422	0.420	0.423	0.425	0.430	0.431	0.432	0.432	0.439	0.435	0.437	0.438

Source: own realization

Annex 3: Port service entropy in Hong Kong by district, 1993-2004

District	1993		1997		2000		2004	
	E value	E` value	E value	E` value	E value	E` value	E value	E` value
Yau Tsim Mong	0.068	0.0542	0.0629	0.0501	0.0668	0.0532	0.0669	0.0533
Central and Western	0.0731	0.0582	0.0656	0.0522	0.0652	0.052	0.063	0.0502
Kwai Tsing	0.0462	0.0368	0.0547	0.0436	0.0548	0.0436	0.0501	0.0399
Yuen Long	0.0274	0.0218	0.0355	0.0283	0.0374	0.0298	0.0425	0.0339
Kwun Tong	0.0323	0.0257	0.0342	0.0273	0.0384	0.0306	0.0399	0.0318
Tuen Mun	0.0347	0.0276	0.044	0.0351	0.041	0.0326	0.0387	0.0308
Sha Tin	0.0287	0.0229	0.0346	0.0276	0.0321	0.0256	0.0329	0.0262
Tsuen Wan	0.0346	0.0275	0.0331	0.0264	0.0297	0.0237	0.0312	0.0248
Wanchai	0.0496	0.0395	0.0395	0.0315	0.0348	0.0277	0.0309	0.0247
Sham Shui Po	0.0302	0.0241	0.0302	0.0241	0.0283	0.0226	0.0308	0.0245
North	0.0176	0.014	0.0248	0.0197	0.0293	0.0234	0.0298	0.0237
Eastern	0.022	0.0175	0.0284	0.0226	0.0215	0.0171	0.0245	0.0195
Wong Tai Sin	0.0156	0.0124	0.0129	0.0103	0.0164	0.0131	0.0199	0.0159
Tai Po	0.0126	0.0100	0.0112	0.0089	0.0125	0.01	0.0173	0.0138
Koowloon City	0.0175	0.0139	0.0215	0.0171	0.0179	0.0143	0.0166	0.0133
Sai Kung	0.0078	0.0062	0.011	0.0088	0.0105	0.0084	0.012	0.0095
Southern	0.0072	0.0058	0.0055	0.0044	0.0076	0.0061	0.0071	0.0057
Islands	0.0007	0.0006	0.0022	0.0017	0.006	0.0048	0.0042	0.0034
All districts	0.5257	0.4188	0.5519	0.4396	0.5503	0.4384	0.5583	0.4448

Source: own realization

Annex 4: Port service entropy in Singapore by district, 1993-2004

District	1993		1997		2000		2004	
	E value	E` value	E value	E` value	E value	E` value	E value	E` value
Southeast A	0.072	0.0574	0.0776	0.0618	0.0784	0.0624	0.0784	0.0624
South B	0.0762	0.0607	0.0768	0.0612	0.0777	0.0619	0.0777	0.0619
Jurong	0.0618	0.0492	0.0638	0.0508	0.0661	0.0526	0.067	0.0534
Southwest	0.062	0.0494	0.0623	0.0496	0.0622	0.0495	0.0634	0.0505
South A	0.0594	0.0473	0.0588	0.0468	0.0563	0.0448	0.057	0.0454
East	0.0454	0.0362	0.0499	0.0398	0.0522	0.0416	0.0543	0.0433
Central	0.0411	0.0327	0.0451	0.0359	0.0439	0.035	0.0444	0.0354
Southeast B	0.0379	0.0302	0.0355	0.0283	0.0358	0.0285	0.0367	0.0292
Northeast	0.0403	0.0321	0.0342	0.0272	0.0344	0.0274	0.0351	0.0279
North	0.0144	0.0115	0.0154	0.0123	0.0152	0.0121	0.0157	0.0125
Northwest	0.0121	0.0096	0.0135	0.0107	0.0144	0.0115	0.0151	0.0121
Pulau Tekong	0.0071	0.0056	0.0069	0.0055	0.0061	0.0049	0.0051	0.004
All districts	0.5298	0.422	0.5397	0.4299	0.5426	0.4322	0.5499	0.4381

Source: own realization