Beyond geographic path dependencies: Towards a Post-Structuralist Approach of the Port-City Interface

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Keywords: Port-City Interface, Structuralism, Post-structuralism, Governance

To be considered for Best Paper Prize

Introduction

In former times ports and cities were seen as coherent wholes; integrated complexes of social, cultural, economic and spatial relations (Polanyi, 1963). In ancient and medieval times, cities prospered thanks to their crucial position in production and trade networks; first on crossroads of peddlers, donkeys, camels, horse carriages etc., and after innovations in vessel- and navigation-techniques on crossings with river and sea routes. Ports, as the intermediary between land and water transport were indispensable in this respect. The most important cities in for instance the Hanseatic or Mediterranean confederation came up thanks to their ports, as those ports grew likewise thanks to the mercantilist importance of their host cities (Pirenne, 1969).
This perception started to change profoundly, due to the ongoing industrialization in the 19th century, followed by technological breakthroughs in the maritime transport industry since the early 20th century (Olivier & Slack, 2006). Initially to adapt to the industrialist conditions, ports transformed from (medieval) staple ports to efficient, modern transit ports; thus serving not only their original host city, but a broader producers and mercantilist region in the fore- and hinterland. Thanks to the accompanying need for logistic and additional financial and shipping services, the original host cities were still able to capture added value from their turntable position within these maritime networks.
This port city configuration started to change profoundly following the container revolution since the 1950s. The container made simultaneous transport of different types of cargo and multimodality possible (Mahoney, 1985). This empowered trade on a door-to-door basis and just-in-time logistics, which in turn propagated global supply chains (Hayuth, 1987; Hesse & Rodrigue, 2004; Slack, 1993). The maritime industry became (sub)continental, but ultimately global and in essence networked. By reason of the competitive character inherent to this (ongoing) international maritime transport sector, minimising additional costs and delays were essential. Therefore, a massive increase in the size of both ships and terminals occurred, leading to an economy of scale (Hayuth, 1987). Moreover following the rise of global transport, freight forwarders began to take control of larger segments of the supply chain to increase the level of functional integration (Cullinane & Khanna, 2000). By setting up their own storage facilities for example, traders could anticipate fluctuations in prices and global demand (Jacobs & van Bergen, 2014). Therefore many distribution functions that used to be separated are now controlled by a single transnational corporation (TCN) or by global strategic maritime alliances (Lee, Song & Ducruet, 2008; Notteboom & Rodrigue, 2005; Olivier & Slack, 2006). All these evolutions in the maritime transport industry induced a global economy; but in turn accelerated also over the past 20 years under the influence of the ongoing globalization (Hall & Jacobs, 2012; Olivier & Slack, 2006).

As a result the former tight interdependence of (host)cities and ports has been cut in multiple ways: spatial, economical, socio-cultural and institutional.
(i) spatial: to receive the new mega carriers and to handle their cargo, deeper channels and enormous terminals and storage facilities had to be built (Lee *et al.*, 2008; Rodrigue, Comtois & Slack, 1997). In search of sufficient space and also due to new and the growing importance of environmental regulations, port areas therefore extended downstream away from their host city (Bird, 1971; Hoyle, 2000).
(ii) economical: first, there is a decline in employment. This because on the one hand, the ports' economic centre of gravity withdraw from the host city which led that traditional labour intensive sectors, such as the shipbuilding industry, disappeared (Lee *et al.*, 2008). On the other hand, the ongoing standardization and automation led that the total number of jobs shows a downward trend in the last two decades. (Atzema, Boelens & Veldman, 2009). Second, as a result of the increasing influence of TCNs, ports seem to become less and less dependent on its geographical location, but more on the ability to adapt to the strategic choices of these TCNs (Atzema *et al.*, 2009; Notteboom & Winkelmans, 2001). Thus economical, host cities are less able to retain the accompanying added value within their geographical core (Hall & Jacobs, 2012; Jacobs, Ducruet & De Langen, 2010).
(iii) socio-cultural: the transition from staple to transit ports was originally induced by so-called 'port-barons' who were firmly embedded in the local urban society. The recent transition from transit to post-Fordism-supply-ports, has been induced by global operating TCN, with headquarters elsewhere in the world. They have hardly any historic-cultural connection to the host city anymore, and rationalize their decision only from a managerial or financial global perspective (Boelens & Taverne, 2012; Burnham, 1941). This has led that the former place ports had in the local urban life disappeared. Today, many efforts are being done to somehow restore this relation, mostly by organizing sport events or touristic routes through ports.
(iv) institutional: the spatial, economical and socio-cultural separation eventually led to an organizational separation between ports and cities. The globalization and the growing influence of TCNs forced ports to be able to react adaptively, prompt and more accurate to the ever-changing demands of international trade. Therefore, most city governments throughout the 20th century institutionally devolved the responsibility for port management from a traditional public port authority to a more or less private port authority. Although generally the majority of the shares are still owned by the (host)cities' administrations, port authorities operate usually without direct involvement of public governments (Brooks & Cullinane, 2006; Verhoeven, 2010).

The separation of port and city on different levels has led that ports became a giant 'Fremdkörper" in an otherwise historical co-evolving urban landscape. Ports lost any sense of local identity. In this way, they resemble the ideas of generic modernist architects (Koolhaas *et al.*, 1995). More and more researchers, however, emphasize the occurring problems following this separation. First, the physical expansion of port areas is increasingly difficult (Wiegmans & Louw, 2011). Under influence of climate change environment standards are changing, this resulting in strong governance dilemmas between economy and ecology (Van den Berghe & De Sutter, 2014). Second, the ports' license-to-operate is more and more questioned. Updates, such as new locks, are in general still supported by public funds. The input of these amounts of money, however, does not lead to an increase in employment, in contrary. This resulted that public money used by independent port authorities, more and more generate profits for a small group of powerful TCNs. Third, the innovative capacity of ports is threatened. Logistical operations have become a commodity; a good, which is easily copied and done elsewhere. Following the globalization, this resulted in a competitive disadvantage for Western ports.

Scholars and practitioners realize that in order to remain competitive, ports need to reinvent themselves by re-establishing the interaction between the urban and port economy to become more innovative (Thierstein & Wiese, 2012). The interaction leading to knowledge spillovers and higher growth rates, is known by Economic Evolutionary Geographers as 'related variety' (Boschma & Martin, 2010). Specific for the port city, this knowledge spillover is referred by researchers as the port city interface: an actor-network where people, circumstances and organisations interact with each other (Bentlage *et al.*, 2014; Boelens & Taverne, 2012; Hall & Jacobs, 2012; Wang & Ducruet, 2012).

Nevertheless, the port-city interface is since some decades a well-studied phenomenon, especially within the field of geography (Bird, 1971; Hoyle, 1989; Norcliffe *et al.*, 1996). Analysing the relevant academic papers from Web Of Science dealing with the port and port city interface since 1950 till 2013 shows an important increase (Figure 1).

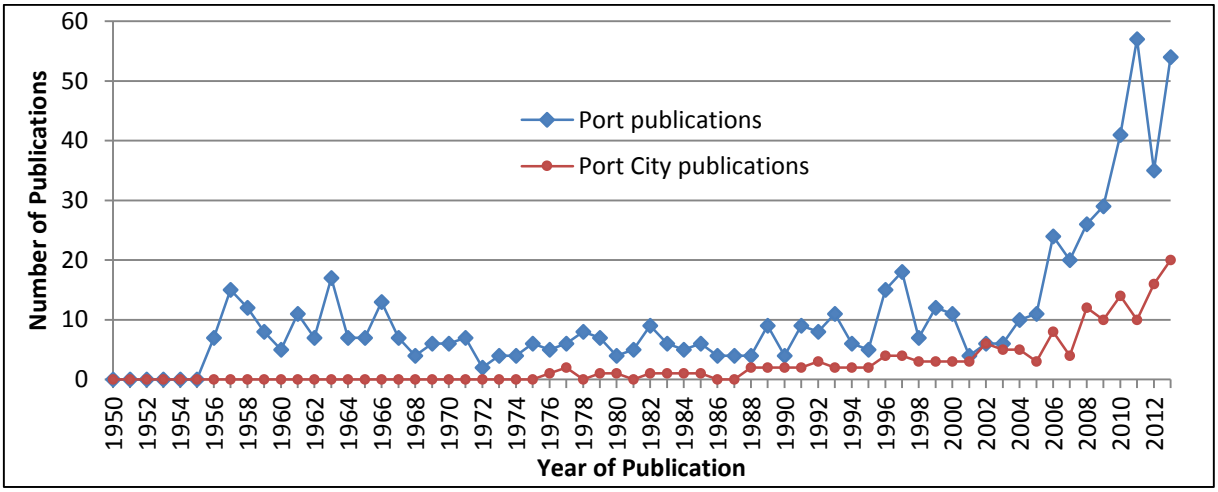

Figure 1: Yearly number of publications in the port and port city research until 2013, Web of Science database

Besides this increase in academic studies, this paper contributes to the call of researchers to fundamentally rethink the theoretical background of the research field (Jacobs & Notteboom, 2011). It is argued that many of recent works still are imbedded in the structuralist paradigm that is going back to of the geographical works of Bird (1963), Hoyle (2000) and Norcliffe *et al.* (1996).

This paper is the first step of a four-year PhD research. The central research question is to examine if the structuralist paradigm fails to comprehend the port city interface. To achieve this, first the research history of the port city interface will be succinctly overviewed. Second, by describing the history of four Belgian port cities (Antwerp, Ghent, Brussels and (Zee)Bruges), it will be shown that each of these port-city interfaces has and is developing according to their own features; therewith falsifying the generic idea behind the models of Bird (1963), Hoyle (1989) and others. It will be shown that this has much to do with the dominant ontology of and within scientific practices. From this, it will be tried to develop a different approach, referring to the new ideas of co-evolutionary and actor-relational approaches. This paper will end with a discussion on what this would mean for future studies regarding the port city interface research.

The port-city interface research

The rapid changing spatial configuration of ports in the second half of the 20th century soon attracted the attention of researchers, these mostly geographers (Daamen, 2007; Olivier & Slack, 2006). Especially the seminal Anyport-model of Bird (1963) and the topological model of Taaffe, Morrill and Gould (1963) became influent works and endured four decades of theoretical and empirical challenge (Slack & Wang, 2002). These studies focussed particularly on the port aspect and tried to explain the observed port configuration, and possible future policy strategies from more or less generic historical analyses.

Depending on the privileged scale, the spatial analytical approach of ports can be divided in two main types: morphological or topological. The topological model of Taaffe *et al.* (1963) conceived the port as a node in the more and more global becoming transport network (Olivier & Slack, 2006). The model seeks a descriptive generalization of an ideal-typical sequence of transport combined with local and regional development (Figure 2). Summarized, the topological model uses a sequence build up by a series of discrete historical stages, beginning on a local scale and ending with the total tranport pattern of a given region (Taaffe *et al.*, 1963). Using the more local scale, the Anyport model of Bird (1963) tried to provide a standard by which the development of ports can be compared. Bird (1963) conceived the port as a direct relationship between form and function. Everytime factors changes, as for example new industrial technologies or the introduction of bigger ships, the form and function changed (Figure 2). Port areas therefore became a chronological and linear succession of historically distinct development phases (Bird, 1963; Olivier & Slack, 2006).

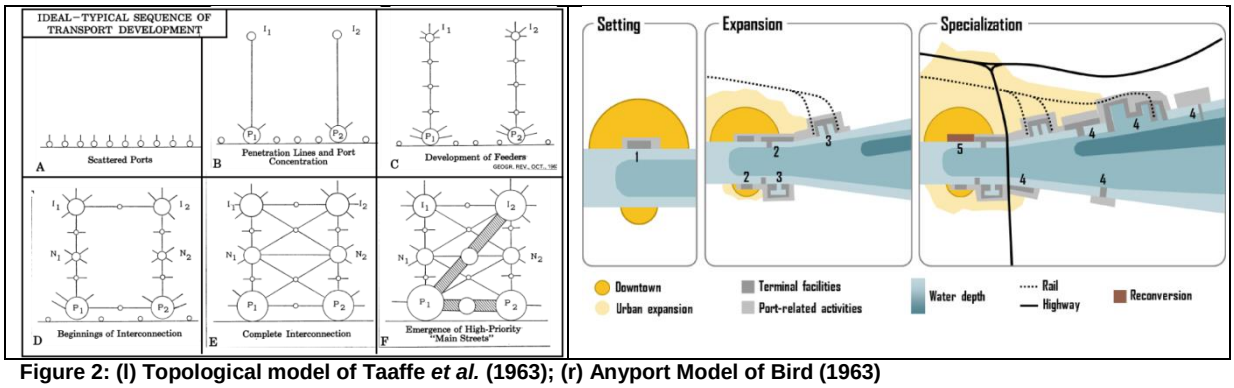

Figure 2: (l) Topological model of Taaffe *et al.* (1963); (r) Anyport Model of Bird (1963)

As Olivier and Slack (2006) argue, the epistemological resonance between the topological and morphological model is striking, depite the use of a different scale and methodology. Both use a generalized chronological and linear story to explain the contemporary configuration of port areas. The use of linear phases has two important applications, first it gives a clear and structure explanation of how ports evolved. But second, it also give a possibility to predict how ports in earlier phases will evolve.

The advantages of this historical-mophological methodology led to one of the most often quoted model in this respect, the port-city interface model of Hoyle (1989). As it became clear that the changing spatial configuration of ports also influenced the urban configuration, Hoyle (1989) stated that port and city are two entitities with a changing mutual spatial zone in between, pointed out as the port city interface (Hayuth, 1982). Using the same methodology as Bird (1963), Hoyle (1989) explained the configuration of the port-city interface by appointing several distinct chronical phases. Each phase is subject to the influence and control of primary factors, such as technological changes and environment, economical and political legislation. Every time these factors change, a new transition of the port-city interface starts (Figure 3).

STAGE	SYMBOL ○ City ● Port	PERIOD	CHARACTERISTICS
I Primitive port/city		Ancient/medieval to 19th century	Close spatial and functional association between city and port.
II Expanding port/city		19th–early 20th century	Rapid commercial/industrial growth forces port to develop beyond city confines, with linear quays and break-bulk industries.
III Modern industrial port/city		Mid–20th century	Industrial growth (especially oil refining) and introduction of containers/ro-ro (roll-on, roll-off) require separation/space.
IV Retreat from the waterfront		1960s–1980s	Changes in maritime technology induce growth of separate maritime industrial development areas.
V Redevelopment of waterfront		1970s–1990s	Large-scale modern port consumes large areas of land/water space; urban renewal of original core.
VI Renewal of port/city links		1980s–2000+	Globalization and intermodalism transform port roles; port-city associations renewed; urban redevelopment enhances port-city integration.

Figure 3: The port-city interface model of Hoyle (2000), based on Hoyle (1989)

The model of Hoyle (1989) distincts several phases. At first, port and city are seen as a close spatial and functional association. Later on, the model explains why port and city grew apart by using several distinct phases. This model initial existing of five phases was later on adapted by Hoyle (2000), who added thus phase 6. In this phase, there is a renewal of the relation between port and city. Instead of a zone of conflict in phase 5, the port city interface is now a zone of collaboration. One could argue that this is similar to phase 1, only the difference now is that this collaboration is between two different entitites. Indeed, in this phase port and city are separated on several levels arising from the former phases, e.g. economical, institutional and spatial. This collaboration comprehends more the change of the negative towards a positive general opinion of former port waterfronts. Signs of this are among others the further gentrification towards uplevel residential neighbourhoods in former port waterfront areas, the upcoming of port museums, activities as port running marathons and touristical port programs (Daamen, 2007; Hoyle, 2000; Schubert, 2011).

Criticism on the historical-morphological appraoach

The historical-morphological model of the port-city interface received severe critiques. Going beyond the view of how the port-city interface reacted on changing circumstances, researchers as Slack (1993) and Willingdale (1984) argued that there was a need to focus more on the processes going on. Instead of only one spatial port-city interface, there are also other interfaces, e.g. socio-cultural, economical and institutional. Backed up by behavioural studies, one argued that ports and its users are part of a global intermodal network (Slack, 1993). This upcoming global intermodal network meant that the developments going on in the port-city interfaces would become highly interdependent on the volatilities and changes in global markets. According to Slack (1993), this resulted in the decreasing control port authorities would have of their own destinies. More and more, global actors, as TCNs, decide what will happen with a port in this global intermodal network. Ports thus became 'pawns in the game" (Slack, 1993).

Nevertheless as Daamen (2007) points out, these studies still tried to generalize the observed changes into models, thus following the previous epistemology. Under influence of more empirical studies and the institutional reforms of the 1990s in infrastructure provisions, this parallel with economic studies, the consideration of governance as an scientific concept of maritime port development was triggered (Daamen, 2007; Olivier & Slack, 2006). This interest resulted in a growing attention for stakeholder relations because private terminal operators could now own facilities in several different ports. Ports thus became seen as 'nodes for contacts and contracts' (Notteboom & Winkelmans, 2001), nodes within a complex web of stakeholder relationships and strategic alliances (Slack & Wang, 2002; Song, 2003). This spatial fragmentation brought the notion of port development as a continuum into question (Daamen, 2007; Olivier & Slack, 2006). The model by Norcliffe *et al.* (1996) is one of the most important works that sees the port-city interface as a continuum, although the model also distinguish clear, but less dated, historical phases (Figure 4).

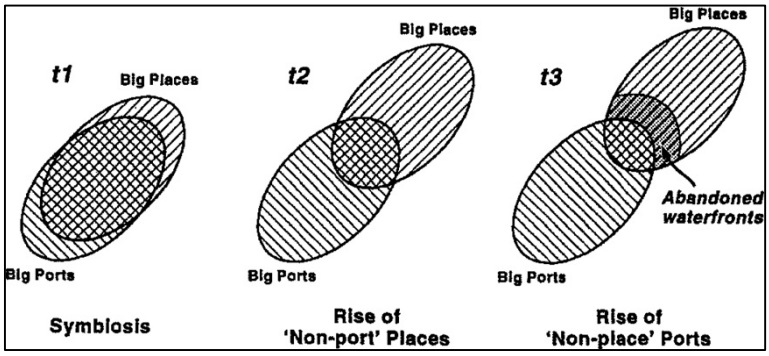

Figure 4: Big cities and ports model of Norcliffe, Bassett and Hoare (1996)

Updates of the main models

Despite the many critiques on the use of general models to explain the port-city interface developments, still at present this is the common analysis method. Indeed, when briefly analysing contemporary works on the port-city interface, a dominant geographical starting point is noticeable, the methodology that goes back to Bird (1963).
In general it can be stated that the former models are being updated when their predictions of the future port or port city developments do not fit anymore with the observations of a certain case study/studies. Examples of these kinds of model adaptations are numerous. One of the most important ones is the model of Hoyle (1989) itself that adapted the model of Bird (1963) with the attention for the city in relation with the port developments. In turn Hoyle (2000) updated his own model by adding a sixth phase, the globalization phase. In the port research, the observed effect of this globalization on port development, was notified as the 'port regionalization phase', an addition by Notteboom and Rodrigue (2005) on the original model of Bird (1963). Based on the port city of Amsterdam, Wiegmans and Louw (2011) extended the model by Norcliffe *et al.* (1996) by adding a 't4-phase', called the conflict phase, to comprehend the observed urban expanding pressure on port areas.

The port city interfaces in Belgium

Thus, despite the critiques, repeatedly it seems that new studies return to the very foundations of partly adapted, but in fact similar economic-geographic ideas of Bird (1963), Taaffe *et al.* (1963) and Hoyle (2000) as a kind of a self-reinforcing port-city model. In the next part of this paper, four case studies will be used to verify whether these kind of historical-morphological models are useful in the port city interface research. To do this, the historic developments of the port-city interfaces of specific Belgian cases will be used: Ghent, Antwerp, (Zee)Bruges and Brussels (Figure 5).

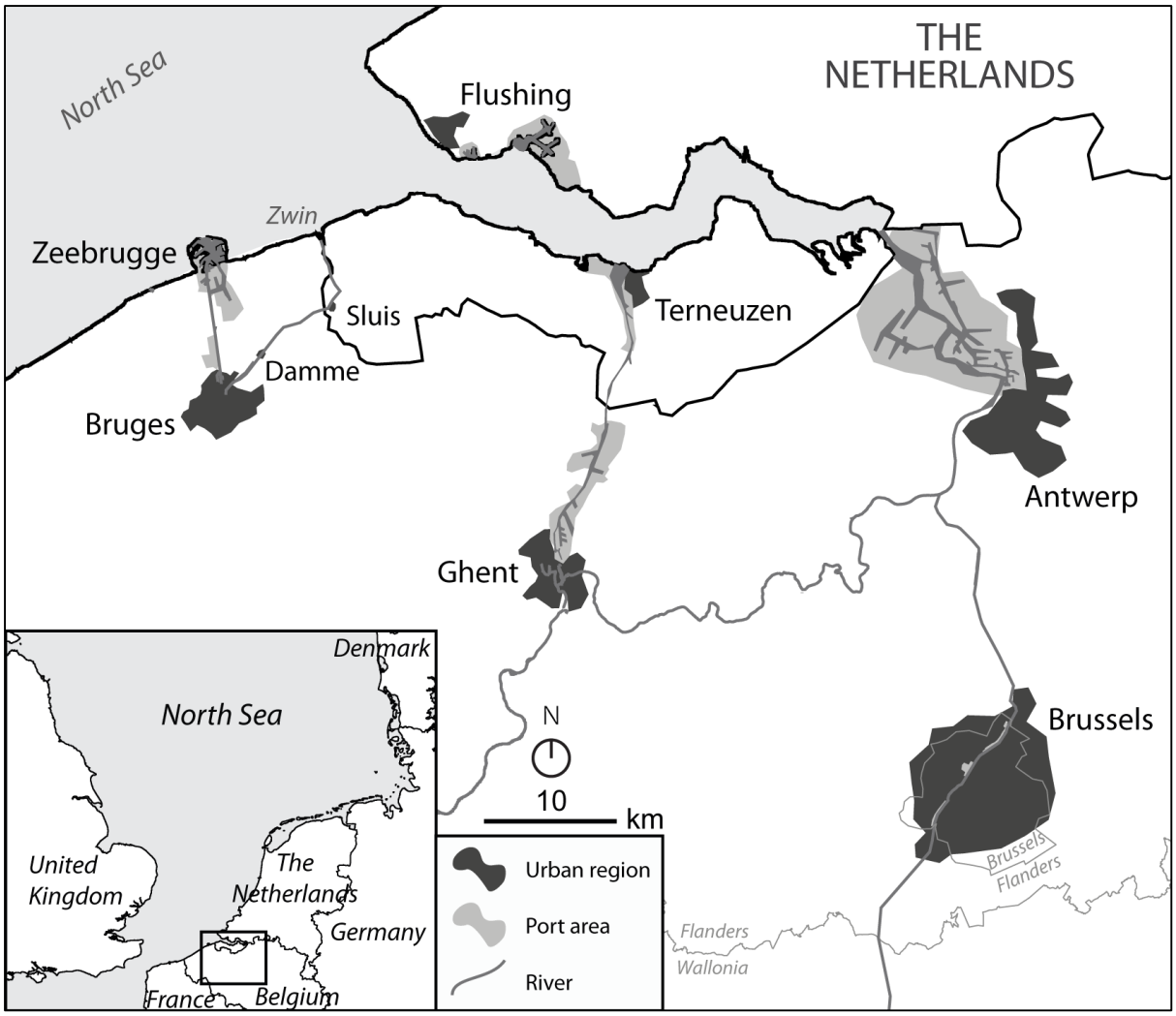

Figure 5: Situation map of the four analysed Belgian port cities

Ghent

Ghent is founded at the confluence of the rivers Scheldt and Lys. Central located in medieval Flanders, soon the city became a powerful and wealthy city following the success of the Flemish cloth. Consecutive wars marginalised the port city's economy since the 16th century. It revived abrupt following the Industrial Revolution at the beginning of the 19th century when entrepreneur Lieven Bauwens opened his textile factory. The import of English wool and the export of textile was mainly waterborn, this especially, through its new northward canal Ghent-Terneuzen. Since then, this canal is the main connection to the sea (Figure 5). As there was still a city toll, the first industrial factories opened up close to the city centre (Boussauw, 2014). Until the 19th century, the port city of Ghent thus stayed in the first phase of the scheme of Hoyle (1989): the phase where there is a closely spatial and functional association between city and port (Figure 6A).

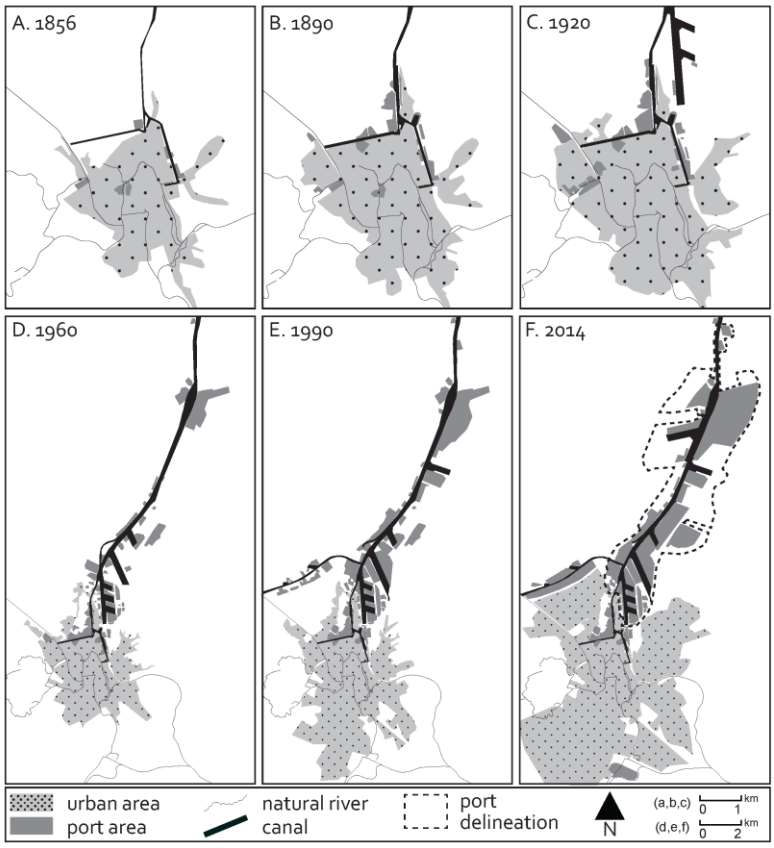

Figure 6: The historical-morphological history of the port city of Ghent

The closing of the toll gates in 1860 led that the built-up area of Ghent could double. The population grew steadily towards 160.000. Meanwhile, Ghent became a famous industrial city. To receive the larger import and export cargo volumes, a new commercial dock was opened to the Nord of the city, connecting directly on the Ghent-Terneuzen canal. For the first time in history, the most important port functions moved out of the centre of the city towards this new dock. This new dock was the cornerstone of what would eventually become the Ghent seaport (Figure 6B) (Boussauw, 2014).

There was significant damage due to the First World War in 1914, but as the infrastructure was updated afterwards, soon the industry alongside the waterways grew rapidly. Figure 6C shows indeed a strong growth of industrial port area. To house these factories, the port territory expanded and new large docks were build alongside the Ghent-Terneuzen canal. The last port areas in the city centre were left. Consequently, in 1930, Ghent became the fourth largest port of Europe, preceding Hamburg, Rotterdam and Antwerp (De Herdt & De Smet, 1995). During the period 1860-1930, the port of Ghent went through phase two of the scheme of Hoyle (2000): the rapidly commercial and industrial growth forcing the port to develop beyond the city confines, with linear quays and break-bulk industries (Figure 6C).

This growth came abrupt to an end due to the economic depression in the 1930s and World War Two. These shocks made that there were no significant investments in the port of Ghent up until the 1960s. As a consequence, meanwhile, the older industrial factories, mainly situated closer to the city centre, were abandoned. To stimulate the port economy of Ghent, national investment budgets were made available. A new sea lock was build in Terneuzen and the canal was expanded. This resulted in the 1960s in the arrival of a large new steel plant (Sidérurgie Maritime) and the arrival Volvo's car and truck plant (Figure 6D). These industries were soon followed by oil-companies in the 1970s (De Herdt & De Smet, 1995). The centre of gravity of the Ghent employment market withdrew from the city (Boussauw, 2014). During the period 1960-1990, the port city of Ghent went through phase 3 of the scheme of Hoyle (2000): industrial growth and the upcoming of oil refining (Figure 6D). The main difference with the scheme is that this was later than indicated and that no container terminal appeared.

Summarized, since the 1950s, the port city of Ghent only fit with some evolutions of the scheme of Hoyle (2000). The port developed further and further away as stated in phase 4 and the older port areas became abandoned (Figure 6E). These older port areas are at this moment still abandoned, so the waterfront development, as part of phase 5, is not yet started. Important to notice is that today there is still no important container terminal in the port of Ghent. The building of the new Kluizendock on the left bank of the canal in 2008 (Figure 6F), is an attempt to catch up with this evolution, although there are no terminals present yet. The last recent development happened on the first of January 2014. From that day on, the independent port authority of Ghent became installed. This port authority became legally responsible for a delineated port area (Figure 6F). This is a feature of phase 6 of the scheme of Hoyle (2000).

Antwerp

The port activities of Antwerp go back to the Roman times. By the 9th century, the city was important enough to be visited by the Norsemen, who transformed the city into a trading centre. From the 11th

century, Antwerp became an important port and commercial centre. The city continuously expanded. Following the silting up of the port of Bruges, until than the main commercial centre in Northern Europe and together with the port of Ghent Antwerp's bitter rivals, plus its central location in the unified Netherlands, Antwerp entered its Golden Age (Van Hooydonk & Verhoeven, 2007). By 1568, Antwerp with one hundred thousand residents became, after Paris, the largest metropolis of West Europe and as an economic hub between North and South certainly the most powerful one (Boelens & Taverne, 2012). Antwerp at that time was an real cosmopolitan city, comparable with 20th century New York. During that time, the port and city were for the first time expanded on a large scale. In one century, the berthing space doubled (Van Hooydonk & Verhoeven, 2007). The Golden Age ended abrupt in 1585 when Antwerp surrendered to the Spanish army. As a reaction, The Netherlands closed the Western Scheldt whereby the port of Antwerp was blocked. Nevertheless, relying on its expertise, Antwerp kept on playing a key role in networks of government finances (Boelens & Taverne, 2012).
According to the scheme of Hoyle (2000), until this time, Antwerp was going through phase 1. This phase ended with the occupation of Napoleon who ordered the expanding of the port. Traffic to Antwerp grew very rapidly under influence of the Industrial Revolution. In order to accommodate growing traffic, the modernisation of quays was continued, fitting with phase 2 of Hoyle (2000). During the 1870s, only the ports of London and Liverpool preceded Antwerp. Between the two World Wars, Antwerp developed its hinterland connections. After World War Two, the Marshall plan funds transformed Antwerp in 1951 into a petroleum port. The founding of the European Economic Community led that many TCNs opened plants in Antwerp. Soon, Antwerp became the second largest petrochemical cluster behind Houston, i.e. phase 3 according to Hoyle (2000). Due to the fierce competition of the nearby port of Rotterdam combined with the oil-crisis in the 1970s and the shrinking space availability on the right bank, the Belgian government decided to build a new port expansion on the left bank of the river. This fits perfectly with phase 4 of Hoyle (2000) . Together with the dredging of the Scheldt, today, the biggest ships can enter the port. In 1996, the port authority became an autonomous municipal enterprise. It remains a public institution, but operates like a private company. In meantime, the older port areas underwent a still ongoing revitalization. A port museum, restaurants and apartment buildings are part of this urban renewal (Van Hooydonk & Verhoeven, 2007). These developments fit with phase 5 and 6 of Hoyle (2000).

(Zee)Bruges

The history of the port city of Bruges is tightly interwoven with the morphological history of the Zwin, a former tidal inlet by which during the Middle Ages Bruges was directly connected to the North Sea. Following this strategic inland position in Western Europe, port activities go back to the Roman times. Similar as in Antwerp, also Bruges was visited by the Norsemen during the 9th century. To prevent these raids, Bruges transformed in a stronghold, illustrating its importance for the region of Medieval Flanders. The international success of the Flemish cloth during the 12th and 13th century transformed Bruges into the most important commercial port city in North Western Europe. The presence of one of the four foreign Hanseatic 'kontors' in Bruges, next to London, Ipswich and Bergen illustrated this. In the 14th century, the Zwin-inlet began to silt up. Therefore, the main port functions moved to the city of Damme, founded more to the north alongside the Zwin. Continued silting made Damme inaccessible in turn. The founding the port of Sluis became necessary. Eventually also this port lost its importance after the Zwin further silted up in the 16th century (Houtte, 1966) (Figure 5). Bruges lost its main connection with the North Sea and combined with the competition of Antwerp, it was no longer the former important port city. The Industrial Revolution did not bring major changes, as happened in Ghent or Antwerp (Houtte *et al.*, 1982).
The young nation of Belgium soon had the idea to build a new military port directly connected to the North Sea. King Leopold the Second inaugurated the port of Zeebrugge ('Sea Bruges') in 1907. In the beginning, the economic development of the port of Zeebrugge was far from a success. Zeebrugge lacks its own economic industry and has no adequate hinterland connections. Also during both World Wars, the port had substantial damage. During the 1960s, Zeebrugge could validate its direct connection to the sea. Following the economy of scale of the maritime transport industry, bigger ships and more roll-on-roll-off and container activities came into practice. Important petroleum storage capacities were built. The port activity moved definitely towards the part of the seaport (Vandercruysse & Baes, 1985). Since the 1980s, following several port expansion phases, Zeebrugge became a major logistical container and roro transit seaport on one of the most busy shipping lines in the world (De Vlaamse Havencommissie, 2013). Looking to the scheme of Hoyle (2000), the history of the port city of Bruges is very hard to fit in. The port and urban functions are clearly separated as predicted in phase 4, but still today, there is hardly any connection between the two.

Brussels

In 979 a fort was built on an island in the swamps of the Senne river. As the river Senne was navigable and Brussels was on the trade route between Bruges and Cologne, soon a port-town emerged around the fort. During the reign of several European Kings and Emperors, Brussels was an important residential place. Especially during the reign of emperor Charles V in the 16th century, the city prospered. Important was his decision to build a canal that would connect the port of Brussels directly with the port of Antwerp, until today this is the main connection (Figure 5). In the first half of the 19th century, the economic position of Brussels improved significantly. The canal towards Antwerp became upgraded and prolonged towards the south of Belgium, towards the important coal and steel industry. After the Belgian revolution in 1830, Brussels became the capital city of the new Belgian nation. Under reign of succeeding kings, Brussels grew significantly. The centralization of power and money led to a strong industrial growth. As import and export was concentrated around the canal, Brussels became a powerful industrial port-city in the 19th century. In the 20th century, Brussels more and more became an administrative city. Industrial activities left the city centre and the port diminished. Today Brussels is de facto the capitol of the European Union (Boelens & Taverne, 2012). Brussels therefore changed from the once industrial towards a major administrative city today. Surprisingly, still today the port of Brussels is situated in the middle of the city (Figure 5). Instead of the predicted evolution of port cities by for example Hoyle (2000), the port of Brussels did not abandoned its historical location. The reason why is political. The administrative region of Brussels is small (Figure 5). The port thus could not relocate out of the city as happened in Ghent, Antwerp and Bruges, as there is no space to do this (Boelens & Taverne, 2012). Today the port of Brussels is small. Its main activities are logistical (Mathys, 2013). Nevertheless, because of its direct connection with Antwerp, still sea ships can navigate to the port (ATO, 2014). Therefore, Brussels is probably one of the last real port cities.

Conclusions in between

Based on the four short historical-morphological analyses it can be concluded that none of these port-city interfaces has evolved in a similar way. Each of these cases has to be regarded on its own, let alone that they would resemble the models of Bird (1963), Hoyle (2000) and others.
In this regard, Antwerp probably fits most as it is the only world port city. Its historical-morphological evolution is similar with those of other world port cities as Rotterdam and Hamburg, however, this also just up to a certain level. Some parts of Ghent's history fit and as described, at present it is 'catching-up' with the predicted evolution. However, in the near future, the port of Ghent is planning to merge with the Dutch port of Zeeland, this in turn a merge of the Dutch ports of Terneuzen and Flushing (Figure 5). If succeeded, the port of 'Ghent-Zeeland' will thus become a new kind of a highly inter-relational complex, deep water-related industrial area, with various socio-economic relations with its broader urban surroundings. The port city interface of Ghent-Zeeland will become multi-dimensional. It is clear that this does not fit in any model. Zeebrugge, in contrary, is and was planned as a stand-alone maritime formation. In essence, this follows the general predictions of the models, especially phase 3 and 4: port and urban functions will separate. However, today this port is highly one-dimensional, only referring in name to its host city. There is hardly a port-city interface at all. Finally the morphological history of the port city of Brussels is totally different as it relatively hardly changed since its foundation. The port functions are still urban. This port city interface is double-edged. On the one hand, the port profits from the added value created by the urban region around it, but at the same time, the port is constantly encroached by the urban demands of the metropolitan city as it cannot move downstream.

Towards a post-structural approach of the port-city interface

The structuralist legacy

Looking at these four different analyses in Belgium, one could ask why academics still hold on to generic port-city models. Moreover, one could wonder why academics, even while criticizing these models, still add to these ideas or come up with similar economic-geographic models themselves; as a kind of self-reinforcing mechanism. To comprehend the current port city interface, every one of these case studies could lead to a different new 'port-city-phase' or an adapted port-city model. We assume that this has lots to do with the structuralistic foundations of each of these approaches. Structuralism is still the predominant ontology of present spatial research (Boelens & de Roo, 2014). In general, the structuralistic approach tries to find the 'deep' structures or arguments to clarify the seeming chaotic and unpredictable character of socio-economic life (Alexander & Smith, 2001). Structuralism believes that those 'generative' drives or mechanisms are organised and patterned like rational models with a

limited number of founding elements, which are more or less related to each other according to a specific order, to be linked up with others in various settings (Murdoch, 2006). Moreover, structuralism approach those (linked-up) systems as more or less 'closed', trying to minimize socio-historic context in order to come up with crystal clear concepts, unambiguous and general enough to allow for comparative analysis (Atkinson, 2005; Routledge, 2000).
In this perspective, the described port-city models are also highly generic, non-situational, trying to explain the port-city interface from supposed all-encompassing drives, with clear cut geographic-economic models, concepts and phases succeeding in time. Therefore, these models are highly structuralistic. But like the structuralistic ontology and as the four historical stories show, these models are, when not misplaced or obsolete, at least not the full academic scope to be reckoned with. In our highly networked and global society, present developments are much more dynamic, volatile, unpredictable, relational and situational heterogeneous than we are able to explain or grasp with, in this case, these structuralistic port-city interface models. Therefore, there is a need to go beyond this dominant structuralistic ontology. A need to develop a port-city interface approach, which is more in pace with the present situational and heterogeneous, but also highly relational developments.

The post-structuralist approach

This section is build up by the ideas of post-structuralist geography as developed since more than twenty years by Thrift (1996), Amin (2002), Belsey (2002), Doel (1999) and others. This post-structuralist geography is in turn referred to the ontological works of Derrida (2013), Foucault and Miskowiec (1986) and Deleuze and Guattari (1988).
Instead of searching for the underlying deeper arguments and drives, in general, poststructuralist are looking for explanations in the context of extensive relations. Instead of underlying structures and scientific explanations, social actions proliferate themselves in complex unexpected ways. Important are the relations between the specific objects, subjects and context at hand (Murdoch, 2006). Therefore, post-structuralism is profound inter-relational. Post-structuralistic geographers are no longer interested in an all-encompassing idea of space, but in the dynamic and profound interrelations. Spaces and places should no longer, or at least not only, be seen as closed and contained, but as open, volatile and heterogeneous. Spaces and places are connected with other spaces and places and are engaged with meaningful actions of actors and non-human actors, i.e. actants. Therefore, spaces and places are not a neutral platform, but are made by those actants and vice versa (Murdoch, 2006).
Recently, post-structuralist ideas are entering the realms of socio-economic research, e.g. the Evolutionary Economic Geographers (Boschma & Martin, 2010), political and management sciences (Teisman, 1992; Van Assche, Beunen & Duineveld, 2014), and spatial planning research (Boelens, 2009; De Roo, Van Wezemael & Hillier, 2012). In recent planning studies the post-structuralistic ontology is even expanded with theories of complexity, mutual adaptation, and co-evolution, in order to come up with pro-active strategies concerning innovative and meaningful actor-networks and actor-relational approaches towards economic/ecologic resilient, but undefined becoming (Boelens & de Roo, 2014). According to these authors:

- planning need to go beyond the restrictive confines of governments and planning administrations (outside-in),
- take the living micro-scale of evolving actor-networks within a specific region or concerning a specific challenge as point of departure,
- point out the variety and possible opportunities of innovative or more resilient assemblages as windows of opportunities,
- shed light on how leading actors in the civic, public and business society could co-evolve towards those opportunities,
- propose how these actors individually or collectively could adjust existing institutional settings and their path-dependencies accordingly.

Discussion for future port-city research

These post-structuralistic ideas could also be very useful for an updated port-city interface approach. Because, as denoted before, this interface also does not get meaning through searching for underlying, so-called generic, drives, mechanisms or crystal clear concepts. The port city interface is a perfect example of a specific open, fuzzy, and inter-relational mechanism of leading entrepreneurs, politicians, the involved civic society, other transnational entrepreneurs, this all within specific institutional conditions of space and time.
In this regard, one of the first attempts to move towards that kind of relational, co-evolutionary approach of the port-city interface are the works of Jacobs *et al.* (2010) and Jacobs, Koster and Hall

(2011), trying to unravel the global network of Advanced Maritime Producer Services (AMPS) in reference to the World City Network of Beaverstock, Smith and Taylor (2000); Friedmann and Wolff (1982); Sassen (1991) and the Advanced Producer Services Network (APS) of Taylor (2004).
Jacobs *et al.* (2011) showed that the global AMPS-network is different than the transport flows between the world ports and also different than the World City Network and APS-network. The AMPRS-network is somewhere in between. Their headquarters are located in the world cities as in the world port cities (Jacobs *et al.*, 2011).

Nevertheless this kind of research is only revealing the port aspect of the port-city interface, a wider approach is needed in order to unmask the present and possible interrelations between the specific economic-geographic port and city interfaces. For that purpose and in according with the post-structural approach, we need to replace the notion of port and city as a geographical entity. Port and city are not clear delineated entities. Port cities are in contrary open, multilevel operating actor-networks in the maritime and urban realm. One could even argue that this idea of a port city complex goes back to the idea of how port cities were organized in former, ancient times (Polanyi, 1963).
To comprehend the port city interface, we need to unmask if, and how leading actors within each of these multi-level, multi-dimensional actor-networks interrelate, this on what realm and for which purpose. These kind of inter-relations are not fixed or static, but co-evolving with each other, this in turn with the specific spatial and institutional conditions. Therefore, not only a current snap shot is important, but also history matters.

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