Clusters in transition

2.1 INTRODUCTION

Ports and their port cities have a mutual relationship. As described in Chapter 1 in the problem analysis, this relationship has been under strain. Because of external and internal forces, the port function in its role as a mercantile place (Vance, 1970; Ducruet, 2006), transshipping goods, and the attached functions like stevedoring, customs, and so on is often no longer found in the city. This process, although quite universal as described by Bird (1963) and many others (Suykens, 1998; Merk, 2014; Merk & Dang, 2013; Charlier, 1992; Hayuth, 1982; Hoyle & Pinder, 1992), has had different outcomes in terms of spatial and functional configurations. In this chapter, the aim is to use the cluster concept to build a research framework to describe and analyze these differences that affect the relationship between ports and their respective port cities. Focusing on the concept of localized growth, the chapter provides a short overview in section 2.3 of the different approaches to concepts of concentration of activities, which form the basis of the cluster concept. They are: a. the industrial complex model; b. the pure agglomeration model; and c. the social network. In this section, the concept of the concentration of economic activities that are more or less mutually dependent is introduced with reference to scholars who have examined this spatial phenomenon. This section also briefly introduces the criticism of these approaches (the subject of section 2.9). Sections 2.4 and 2.5 deal with the industrial complex and the model of pure agglomeration approaches. Section 2.6 pays attention to a special approach that links the industrial complex model with the social network model: the cluster as identified by Porter (1990a). The concept of clusters provides the bridge with the third model, the social network model (discussed in section 2.7). Section 2.8 relates the models of localized activities to space and the relations between activities and location. Section 2.9 is important for understanding the latest developments in cluster thinking by dealing with the criticism of its applicability. Section 2.10 elaborates on that by showing that, despite the criticism, the cluster theory still provides a useful tool when these new insights are incorporated. Section 2.11 offers two new concepts based on the new approaches to clusters, illustrated by examples from port city situations. Section 2.12 wraps up the concepts from this body of knowledge as part of the research model for characterizing the port clusters of Rotterdam, Antwerp and Hamburg.

2.2 PORTS AS CLUSTERS

Ports are often seen as clusters (De Langen, 2004; Nijdam, 2010; Pigna, 2014). The concept of a cluster, with all its features like linkages, the different cluster actors, the private and public role of these actors, and the way these roles and their interacting change, is a useful tool to describe and understand the composition of different ports. Nijdam (2010) states that the cluster is on a different scale than the industrial district because it consists of firms and organizations that do not have to be located in the same region. He is quite strict regarding the bordering of the cluster. He defines the boundaries by using the variables:

- The number of port firms;
- The amount of port-related employment;
- The specialization in port firms;
- The specialization in port employment.

Doing so however, Nijdam does not include the port city in the cluster. For De Langen (2004), the city can be include in the port cluster when the municipality meets two conditions: it is located in the proximity of the port, and there is a high concentration of port-related activities (De Langen, 2004, p. 96). This creates a port cluster region that includes:

- The primary port area;
- The business district of the port city;
- Secondary nodes in the proximity of the primary seaport;
- Municipalities in the vicinity of the port with a concentration of port service activities.

De Langen includes the city's activities when he summarizes the firms in the Rotterdam business district of the port city. Pigna (2014) puts even more emphasis on the presence of the city. He acknowledges the importance of competition between firms within clusters, as Porter does. It concerns interfirm competition; but he makes an interesting remark about port clusters: ports are competing whereby "competition is not between countries or regions, but between global cities and supply chains" (Pigna, 2014, p. 88). So, the port needs a strong city partner. Attention needs to be paid to the position of the port in relation to its city partner. For a long time, this relationship was an interdependent one, spatially strongly connected, characterized by its land–sea interface, being a bridge point for trade and a hub for commerce. In the early days, the port city started as a center for defense (or collecting tax), then as a center for trade, and then as a warehouse and a location for port-related manufacturing. Next, the development of the port industrial complex started with

its petrochemical industry and, as an accelerator, the emergence of the container with the bigger vessels that needed larger-scale quaysides. From that moment, the separation between port and port city started. The relation rapidly changed because of:

- Increasing size of ships: pushing terminal development downstream to deeper water;
- Consolidation of shipping and logistics companies globally;
- Growing cities, so a struggle for land;
- Decreasing direct port employment, new types of employment do not have a huge effect on the city's community in terms of labor opportunities (Pigna, 2014).

Pigna (2014) pays attention to the consequences for the port city of these developments and concludes that, by relocating the port's areas in the city, large areas of land, used for former heavy industrial activities, became desolate and unattractive underdeveloped sites. His research convinces him that ports suffer from the demanding cities and that the port should be protected from the city. He therefore does not address the formal and informal relationships that exist or could be established to mutual benefit. Pigna places the port in the underdog position; this is rather curious given that the relocation of port activities is not the result of a powerful, more demanding city, but rather the result of the dynamics as discussed in the problem analysis – developments that Pigna acknowledges (first and second bullet points above). However, he apparently considers the struggle for land a stronger issue in the port–port city relationship, and he has a point given the developments in the last two decades in Hamburg, as illustrated in Chapter 9. But this emphasizes the interconnectivity between port and city, so this thesis considers the port and the port city as parts of the same cluster. In doing so, it follows De Langen (2004).

2.3 LOCALIZED GROWTH

The concept of localized growth in the spatial economy (Gordon & McCann, 2000) is a subject that interested scholars from different disciplines throughout the 20th century. Starting with Weber (1929), with his multidisciplinary background – but approaching this phenomenon mainly from a least cost model to explain location – economics, geography, and sociology have contributed to the understanding of the location of economic activity in space (Krugman, 1991). Although for Krugman it has all to do with concentration, different approaches can be recognized in this concentration of activities. In the end, many of them affirm that this concentration generates imperfect competition that leads to increasing returns for the concen-

trated activities and thus forms the basis for their existence. These concentrations are based on differences – differences in economic performance and labor market performance but also differences such as differentiation of government policy, scale economies, and agglomeration economies (Clark, Feldman, & Gertler, 2002). The approaches can be summarized as models of pure agglomeration (Marshall), the industrial complex (Weber), and the social network (with, for example, Granovetter as representative of this approach) (Gordon & McCann, 2000). As these models are mostly static in their approach – they describe a certain situation – recent literature has also paid attention to the forces inside the cluster that influence growth and decline or shape these concentrations of activities (Chapman, 2005; Neffke & Henning, 2013; Menzel & Fornahl, 2009). These models are discussed in the next section. This section is needed to understand how concentrations of activities in ports can be studied and what kind of concepts they provide to analyze the phenomena that arise when these port activity concentrations occur. In particular, ports, and their relationships to the cities in which they more or less are located, are perfect examples of how these relationships change, as shown in Chapter 1 where the problem of the relationship between ports and their respective port cities was defined.

The models and approaches mentioned in this section have also developed, as will be shown. This development provides the researcher with tools that can give insight into the assumed differences between the three ports under study – differences that, as stated in the first chapter, are to be explained not only by mere location or results of supply and demand, but also by the dominant political-economic system in which these ports function. These influences clearly are not very obvious if studied from the perspective of the most basic models like Marshall's industrial district, but they become more visible when researched from the perspectives of more recent approaches: skill relatedness, locked-in regions, comparison over time by applying the perspective of cluster life cycles. Finally, this thesis establishes a connection of the observed differences in clusters with the two other elements of the theoretical concept of this thesis: governance and institutional arrangements. The theories on spatial concentration contain elements that help to elucidate the history of port city clusters. Therefore, a brief review on these theories and the different emphases they lay on certain concepts are discussed in the next sections.

2.4 THE INDUSTRIAL COMPLEX: THE FORMATION OF A GROUP OF INTERLINKED FIRMS

An overview of theories on spatial concentrations reveals Weber as one of the founding fathers of the study of location. In fact, his forerunners in economic studies already paid attention to spatial concentration of human activities, and, because of their historical context, this focused mainly on agricultural production (Krzyzanowsky, 1927). A well-known representative of this was Von Thünen with his positioning of concentric rings with various types of agriculture where the spatial distance of each of these activities is determined by only one factor: the cost of transportation to the centrally located market (Broek & Webb, 1973). Weber paid attention not only to transport costs in terms of location of an industry near or further away from the place of consumption: *Transportorientierung* (although he is mostly associated with that), but also to the differences in costs to produce one ton of a commodity: *Arbeitsorientierung*. The third factor is the difference in costs consequent to the concentration or the dispersion of industries. This is what Weber calls "*agglomeration*" (Krzyzanowsky, 1927, p. 282). However, Weber and his predecessors, when researching firms and their individual location, did not deal with a concentration of firms related to the same industry.

2.5 THE MODEL OF PURE AGGLOMERATION: LABOR SPECIALIZATION AS A SPATIAL DETERMINANT.

It was Alfred Marshall with his *Principles of Economics* who first characterized clusters as a "concentration of particular branches of production in certain localities" (Marshall, 1920, p. 222). Marshall himself (1920) was of the opinion that this description (localized industry) might not perhaps be accurate. For this phenomenon, he coined the term *industrial districts*: "…groups of skilled workers who are gathered within the narrow boundaries of a manufacturing town or a thickly peopled industrial district" (Marshall, 1920, p. 225).

2.5.1 The quest for the physical determinant, space

In the early years of the 20th century, production was characterized mainly by manual and labor-intensive production systems. The examples given by Marshall (limited to the UK) are, for example, Staffordshire (pottery), Bedfordshire (straw plaiting), and Sheffield (steel). This was explained by the fact that the chief imperatives for these locations were physical conditions: the availability of resources in combination with (cheap) labor. He also paid attention to another spatial phenomenon, that of

increasing land rent: the fact that trade in the produced goods, which was located in the town centers, increased the ground rents. These rents became too high for the factories, which relocated to the outskirts of the manufacturing towns. The same happened regarding competition for dwelling spaces that became affordable only for the employees of the trading houses who competed with the factory workers. So, Marshall was already paying attention to the forces of spatial competition between the various sectors of the economy, which even today is a dynamic force, as can be seen by the gentrification processes in port cities with their possible negative effects on the original citizens. So, for Marshall, there certainly is a situation of imperfect competition. This spatial competition can create barriers to entry for some industries that want to settle there (or would like to stay). Krugman (1998) elaborates on these side effects when discussing aspects of the new economic geography.

The spark that triggered these concentrations was physical conditions: climate and soil, the existence of mines and quarries, and accessibility by land or water (Marshall, 1920, p. 223). So, the development of ports can be ascribed to the physical condition, accessibility, in terms of their position towards the sea, and later by the presence of a work force that was skilled in handling imported and exported goods, and competition for the space available. Three phenomena can be identified for these concentrations of specialized industries. First, a pool of laborers with specialized skills is needed (Krugman, 1991). Second, scale plays an important role. In these localities, firms were closely integrated with one another but had fewer linkages besides marketing their products. Each of them taking care of one small branch of production had to make full use of the expensive machines in which they had invested, so they were exploited to the maximum to make them pay their expenses (specialization within the concentration). The third source of these districts is found in the fact that in these centers information flows more easily, or as Krugman (1991) expresses it: there are technological spillovers.

2.5.2 Information flows

Krugman's elaboration of the information flows by calling them technological spillovers is an interesting one. This is the starting point of more recent contributions to the theory of concentrations of activity. It is this element within the cluster approach that needs to be studied to answer the central question of this thesis, in how we can understand the relationship between port and port city. Therefore, it is interesting to address the nature of these information flows.

2.5.3 Socio-cultural context

Marshall describes the roles of different firms in their contribution to the production of a specialized product or series of products. Alberti (2001) remarks that Marshall not only paid attention to the business relationships in that locality, but also stressed the socio-cultural aspects of this spatial concentration. He characterizes industrial specialization as follows:

- It is a concentration of specialized industries in particular localities;
- It is comprised of small locally owned firms;
- Linkages and cooperation with firms outside the district appear to be minimal;
- There is a high-quality local labor market;
- Workers appear to be committed to the district rather than to the firm;
- There is a relatively stable community with a local cultural identity and shared industrial expertise.

Because industrial districts have their roots in common culture and are generally industry specific, Alberti (2001, p. 8) considers them to be acting as a whole, like a corporation. This approach aims to discover differences between spatial concentrations not only from the perspective of physical conditions, labor pools, division and specialization of activities, and information flows, but also from the perspective that these spatial concentrations are located in an economic, socio-cultural (political) context. Alberti is first and foremost interested in Italian industrial districts, as also recognized by Porter (1990b), when discussing Italian clusters, and, with reference to these districts, he adds some other features:

- It is a homogeneous system of values and views;
- It has strong local government;
- The local bank is born and bred in the district and very closely linked to local entrepreneurs.

These features characterize the way in which governance within the industrial district takes shape (Figure 2.1).

Alberti is deeply interested in the individual actors that together give shape to the different aggregated roles like collective and individual actors. This allows Alberti, who is trying to understand the governance of a region, to operationalize these different actors by recognizing who can be taken into consideration when describing and understanding the development of policies that direct the region under study. He considers this as an Italian variant and additional to the characteristics of the original Marshallian industrial district. These features should not, however, be

considered as characteristic of Italian regions only. Rather, they can probably be better seen as characteristic of continental-type capitalism as discussed in Chapter 5.

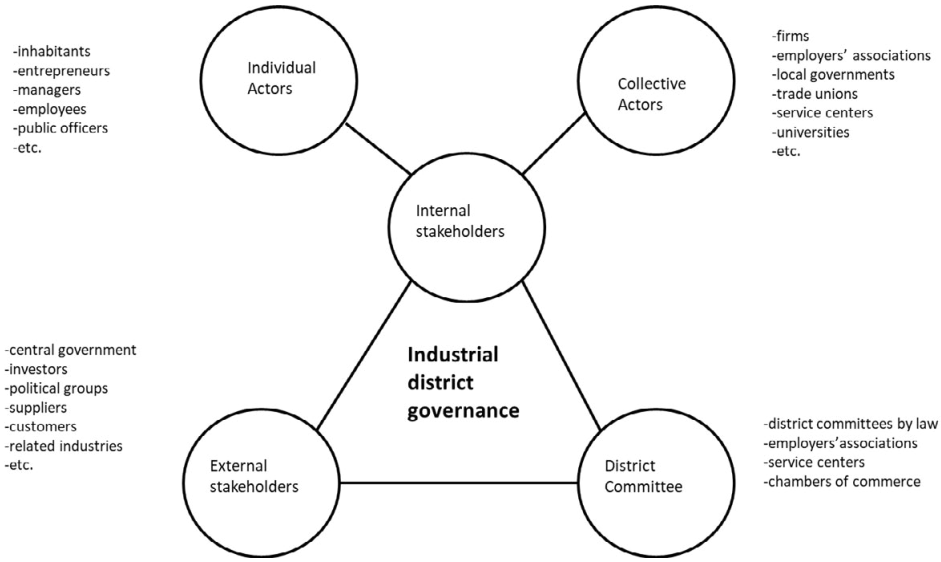

Figure 2.1 The governance model proposed for industrial districts (Source: Alberti, 2001)

2.6 THE CLUSTER AS AN INTERLINKED SOCIETY

When researching the concept of clusters, one cannot underestimate the contribution of Porter (1990a). This scholar, well known for his contributions to the study of competition and competitive advantage (Porter, 1980), situates the cluster as an organization to achieve (national) advantage in a competition between regions. The cluster is "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Porter, 2002, p. 254). Porter considers the cluster to the most important unit of economic activity, one that is often ignored (he mentions the federal level in the US) (Porter, 2009). An economy consists of "a series of regional economies that trade with each other and the rest of the world with its own particular pattern of cluster specialization" (Porter, 2009, p. 2). To demonstrate this point, he created his "diamond" (Figure 2.2), which consists of: 1. factor conditions (human resources, physical resources, knowledge resources, capital resources, and infrastructure); 2. demand conditions (home-buyer needs[5]); 3. related and supporting industries (internationally competitive by themselves, these suppliers communicate information

5 "…the home demand gives local firms a clearer or earlier picture of buyer needs than foreign rivals can have" (Porter, 1990a p. 86).

and innovation from firm to firm, so creating a self-reinforcing information network); 4. firm strategy, structure, and rivalry: the context in which firms are created, organized, and managed as well as the nature of domestic rivalry (Porter, 1990a).

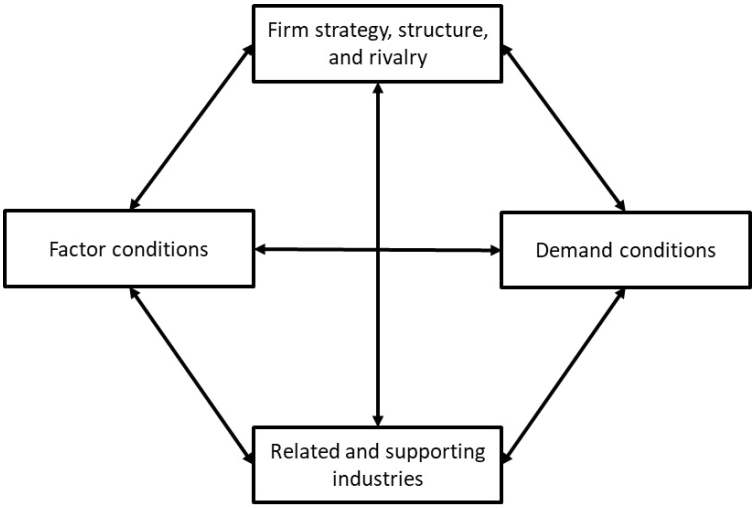

Figure 2.2 The determinants of national advantage (Source: Porter, 1990a, p. 72)

The interplay between these factors determines the strength of the cluster in its competition with other clusters in the industries abroad, because in the end "the fundamental goal of economic policy is to enhance competitiveness" (Porter, 2009, p. 1). The driving forces for the cluster are not only geographic industry concentration, but also, and this is typically Porter, domestic rivalry. "Two elements… have especially great power to transform the 'diamond' into a system, domestic rivalry because it promotes upgrading of the entire national 'diamond', and geographic concentration because it elevates and magnifies the interactions within the 'diamond'" (Porter, 1990a, p. 131). So, the element of a geographic concentration of activities was already the focus of the industrial district approach; Porter's contribution is that he links it to a driver in terms of competition with other clusters.

2.6.1. Intangible forces directing interactions

For Chapman, the most important difference between the cluster concept and the industrial complex model of agglomeration is "its acknowledgement of the significance of intangible information-based networks…" (Chapman, 2005, p. 606). This element is important for this thesis, as attention is focused on it in the discussion on the concept of tacit knowledge, seen as an important aspect of differences between port–port city relationships within their respective clusters. Paying attention to this

last factor, Porter observes that, in Germany, senior executives, having a technical background, have a strong managerial focus on product and process improvement, thereby leading to success in technical and engineering content. However, he also acknowledges less-tangible aspects that influence the way in which firms are organized and managed: attitudes towards authority, norms of interpersonal interaction, workers' attitudes towards management, and social norms of individual or group behavior (Porter, 1990a, p. 109). For Porter, as a scholar in business and management studies, location and the role of clusters have been too neglected in the management studies discipline. He sees the firm as located in space, and this locational factor influences firms' strategy, management, R&D, and so on – in brief: business policy. Porter (2002) considers this approach as a way to reveal companies' public role. Giving more shape to the context wherein the cluster functions, Porter adds the elements of chance and government (see Figure 2.3). Government in particular is the important element for this cluster approach in view of this thesis's research. Government influences the four determinants positively or negatively (Porter, 1990a, p. 127).

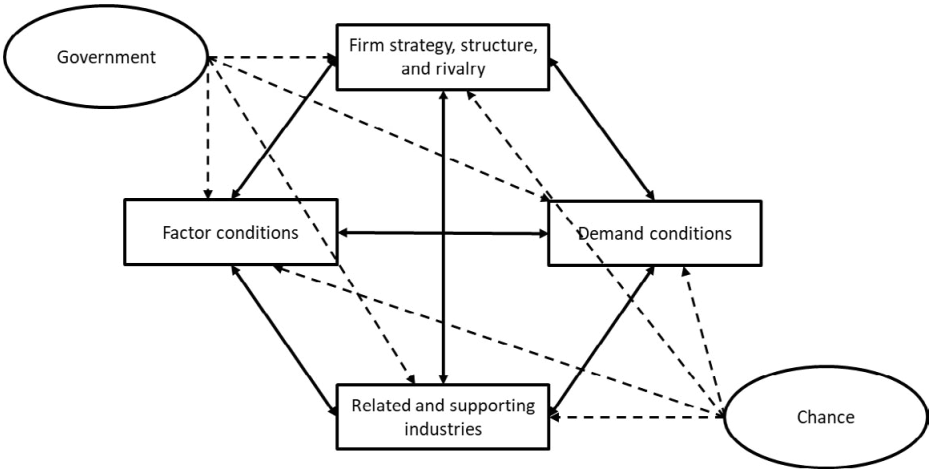

Figure 2.3 The determinants of national advantage: the complete system (Source: Porter, 1990a)

Motoyama (2008, p. 354) includes governments in the box of related and supported industries by adding "governments and universities to trade associations and experienced capital". This is an interesting perspective. It shows that scholars ascribe different weights to the role of governmental institutions in relation to the cluster. In the empirical part of this thesis, attention is paid to the different roles that governments and (formal) governmental organizations (e.g. port authorities) might fulfill (or have fulfilled) in the various political-economic contexts. The assumption

is that this might have led to different outcomes in the way in which the port city relationships have developed. The interesting question then arises: is there such a thing as a Continental port cluster, an Anglo-Saxon port cluster, and a Latin port cluster, based on features of the three corresponding dominant political-economic systems? That is why aspects of governance are addressed in Chapter 3 of this thesis. Porter describes government's role as "... a catalyst and challenger; it is to encourage – and even push – companies to raise their aspirations and move to higher levels of competitive performance, even though this process may be inherently unpleasant and difficult" (Porter, 1990b, p. 87). However, for Porter, government as an institution in itself is an external force and should not be incorporated within the cluster. So it is placed more or less outside the diamond as a force to be taken into account, but not as one of the factors. The other factors have interdependent relationships (the lines between the factors); this interdependence is not for government itself. Motoyama attributes a greater role to the government, as do other scholars such as Chapman when describing the decline of the Teesside cluster (Chapman, 2005).

Porter (1998) elaborated on his thought on cluster development and became even more concrete in his focus on these intangibles when he describes the possible strategic agenda of clusters. As the second issue, he formulates the activity of engaging locally: "to maximize the benefits of cluster involvement, companies must participate actively and establish a significant local presence" (Porter, 1998, p. 88). This is about personal relationships, face-to-face contact, a sense of common interest, and insider status. This is less intangible compared to his first consideration of the aspects of the way in which firms are organized and managed in his *Competitive Advantage of Nations* (Porter, 1990a). This is an attempt to open up the black box of intra-cluster behavior that is integral in trying to get an idea of how political culture expresses itself with effects on cluster development. It is an element needed to operationalize the nature of the linkages as described by him in 1990. This thesis elaborates on that. It researches these linkages between the different actors that together are responsible for this cluster development – actors that are not restricted to firms, just as Porter has a broader view on this. For Porter, compared with the notion of industrial districts, clusters are more than concentrations of industrial firms. They include academic institutes and trade associations and have a direct relationship with public services because they "draw on the broader public assets such as schools and universities, clean water, fair competition laws, quality standards and market transparency" (Porter & Kramer, 2011, p. 12). As other scholars remark however, Porter's diamond describes a rather static situation. Although in his examples he addresses prosperous and declining clusters, he describes the forces

behind these developments in terms of the outcome, without a theoretical base. But he certainly has an interest in the multiplying effects of the firms in the cluster.

2.6.2 A common base for intangible forces: shared values

Porter elaborates on Marshall's attention on the socio-cultural aspects of these economic concentrations. The cluster often works two-sidedly: "it not only increases the demand for specialized inputs but also increases their supply" (Porter, 2002, p. 260). Specialized personnel and services are available. The cluster itself then must be attractive enough to accommodate these services, otherwise this reinforcing mechanism will stop.

Until then, according to Porter, firms paid hardly any attention to relations and spin-off effects that affected society. These were seen as peripheral matters instead of (often negative) externalities. In the relationship with the environment, a trade-off between the benefits and costs for society needs to be made. This creates a responsibility for the firm in the cluster where it engages other firms and public space. This does not have to be a burden for the firm; on the contrary, this engagement will create "shared values" (Porter & Kramer, 2011, p. 7). This is an interesting element to be taken into consideration. In the analysis in this thesis of port–port city relationships in the port cluster, a comparison is made between the three ports in terms of how their political systems influenced different public spaces. Phenomena to be studied are how the public authorities engage with the cluster firms and the effectiveness of their influence or their exercised authority. That requires a historical approach that describes the different interactions in time and their spin-offs in terms of shared values, i.e. spin-offs that were beneficial for the port's as well as the port city's development. This historical approach is the subject of Chapters 8 and 9, where the development of the ports of Rotterdam, Antwerp, and Hamburg is discussed. Of the three factors mentioned by Porter and Kramer (2011) as creating shared values – reconceiving products and markets, enabling local cluster development, and redefining productivity in the value chain – it is the last one that puts this local cluster development in its center. It is first and foremost about redefining productivity. For Porter, the success of the cluster contributes to the success of the community, and for that regulation is necessary:

- To set clear and measurable social goals;
- To set performance standards;
- To define phase-in periods for meeting standards (give time to firms to adapt);
- To put in place universal measurement and performance reporting systems;
- To report results in a timely and efficient way.

Clusters are set amidst society and help it flourish, as can be seen in the impact of cluster as described by Figure 2.4.

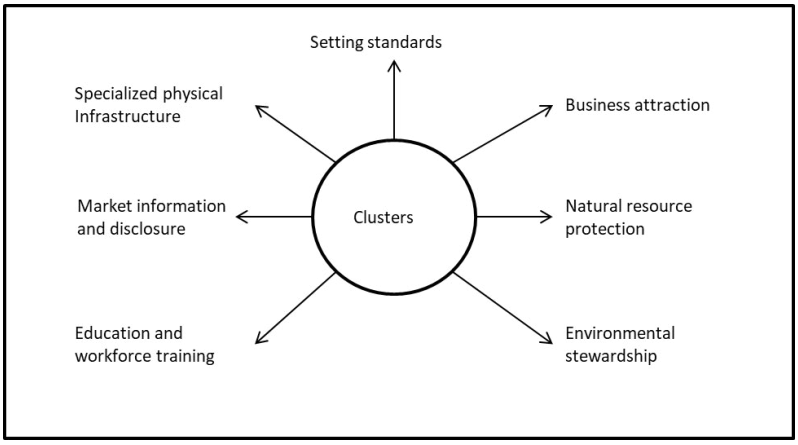

Figure 2.4 Clusters and the implementation of economic policy (Source: Porter, 2000)

For Porter and Kramer (2011, p. 17), the shared values concept helps firms and society to focus on the "right kind of profits" that create societal benefits. For them, it has nothing to do with philanthropy but rather creating economic value by creating societal value. Here, it is interesting to see whether this concept is more congruent with the Continental political-economic system than with the Anglo-Saxon one, where probably more emphasis is placed on share(holder) value than shared values. Value sharing can be seen on different levels:

- The sharing of the outcome of economic activities that can be described as shareholder or stakeholder revenues;
- The sharing of common values that lead to economic outcomes in terms of how the relationship between employers and employees must be structured;
- The way in which private and public interests are more or less congruent in their desired outcomes in which both of their interests are satisfied.

There is not just one shared value in terms of the "right kind of profit" cluster; several manifestations lead to this. It is in observing these kinds of existent or non-existent shared values that diversity in various socio-political contexts can be described. Although Porter does pay attention to a shared values outcome, for him it is the outcome in economic terms that helps to enhance the competitive strength of the region (and so its firms). Other than Chapman (2005), hardly any literature pays attention to the relationship between cluster behavior and economic socio-political contexts, let alone perceived from the perspective of an Anglo-Saxon approach versus

the (less well-known) Continental and Latin approaches. The strength of the cluster is defined in the relationships between firms, related industries, institutions, and government. These relationships are enhanced by the quality of the complementarities and commonalities that these actors within the cluster possess in relation to one another, as depicted in Figure 2.5.

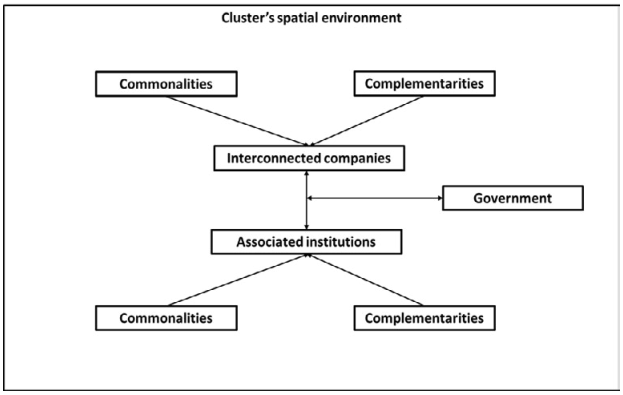

Figure 2.5 A model of relationships in the cluster (Source: author)

So, companies and associated institutions both have their commonalities and their complementarities with a common ground in shared values, and the interaction between the two is influenced by the degree to which government tries to impose its policies to the benefit of the cluster as a whole.

2.6.3 The organization of intangible forces: actors shaping the cluster

De Langen (2004) approaches the cluster concept from the micro level to the macro level. For him, the cluster is primarily characterized by the presence of a population. As that is not static, this element of a cluster is under constant change. The next level is that of the spatial entity: the geographical concentration of the population. As a next level, he adds the institutions where this population is organized: business unit, associations, and public or private organizations. So, the link is made to population and these business units, associations, and organizations. Finally, he defines the specific identity of a cluster by stating that it is all organized around a specific economic specialization. This is needed to be able to define cluster borders (De Langen, 2004, pp. 10–11). The contribution of De Langen's scope to this thesis is that he more or less defines the relationship between the people in the region with the firms and institutions that define the port cluster.

2.7 THE SOCIAL NETWORK

Relationships are important, but more than shared values can be observed in the linkages between the cluster components (firms, institutions, associations). The relationships within the cluster are central to the concept of the social network model. Related to clusters, this model does not take the firm's behavior as the object of study, but rather the personal relations within the network, where the forces that contribute to cluster behavior are trust and routine practice (Gordon & McCann, 2000). Trust-based behavior is a basic element of the social network model and is characterized by three key features:

- Firms are willing to undertake risky and co-operative and joint ventures without fear of opportunism;
- Firms are willing to re-organize their relationships without fear of reprisals;
- Firms are willing to act as a group in support of mutually beneficial goals (Gordon & McCann, 2000, p. 520).

These relationships go beyond market contracting. There is more at stake than the outcome for the individual firm. The study of these relationships in terms of a network model stems from the work of Granovetter (1973, 1983). It is rooted in the concept of social embeddedness that deals with the notion that business firms are rooted within specific social, cultural, political, and institutional contexts that influence how they develop (Dicken, 2009). One might argue that Porter has more or less the same notion, although he does not take this perspective as the core of his approach, given that firms' relationships with suppliers and customers and internal rivalry with competitors come more within the scope of his concepts (Dicken, 2009). Dicken, investigating the way in which transnational corporations use space and place, distinguishes four types of interconnected sets of relationships:

- Intra-firm relationships (between different parts of a transnational business network);
- Inter-firm relationships (between firms belonging to separate, but overlapping, business networks);
- Firm–place relationship (the firm tries to extract the maximum benefits from the communities in which they are embedded, and vice versa, as communities try to derive the maximum benefits from the firm's local operations);
- Place–place relationships (between places, as each community tries to reap the most from investments (jobs) by transnational corporations) (Dicken, 2009, p. 285).

These relationships are themselves embedded within national political and regulatory systems. Dicken concludes that, because of this embeddedness, it is interesting to see the effect of the nature and varied and divergent forms of capitalism (Dicken, 2009, p. 288). This was also acknowledged by Gordon and McCann (2000, p. 520) who state that "In fact all economic relations are …socially embedded in the sense that these depend upon norms, institutions and sets of assumptions shared among a group of actors and are not, in themselves, simply the outcome of economic decisions." Gordon and McCann, however, are of the opinion that, from an empirical point of view, the applicability of the social network model is disputable: where the social network is "…associated with the development of a place-specific cluster, it is possible to view this model as exhibiting some of the characteristics of the two previous models of spatial industrial clustering" (p. 521) (i.e. the model of pure agglomeration and the industrial complex model).

Granovetter takes as closer look at the nature of the linkages between actors, be they individuals or firms. He distinguishes weak ties and strong ties (Granovetter, 1973). Weak ties are ties that are rather infrequent and over a distance, whereas strong ties are embedded in a social structure. He stresses the need for weak ties to 'import' new knowledge. In contrast to Porter (who in fact does not pay attention to the variety of power exerted by the linkages), he emphasizes the importance of weak ties, which are able to bridge "structural holes" that divide the various networks. These weak ties "constitute the only route through which information or other resources may flow from one network sector to another…." (Granovetter, 2005, p. 35). New knowledge is essential for the development of the social network, hence his interest in the effect of strong and weak ties. Granovetter observes that embedded (strong) ties are needed to establish a functioning social network with the desired economic outcomes (it is one of his core principles), but he also sees the danger of these strong, established relationships. They have a positive influence in stable situations, but in times of change they may prevent adaption to these new circumstances: "lock firms into relationships" (Granovetter, 2005, p. 43). Chapman uses the concept of being locked in as a result of the emphasis on regional specialization (Chapman, 2005). He remarks that a cluster can get locked in if it is too inward looking and if it is too specialized in its economic structure. For Chapman, cluster development is not only about the exploitation of linkages with other industries, but also about competencies/skills acquired through experience in the industry that may be applied in related sectors, described as the two mechanisms of cluster development.

So the study of relations within a spatial environment has had different perspectives throughout time. Appendix 2 summarizes the various approaches. As can be seen in Appendix 2, the development of cluster models or the establishment of firms and services in a certain area made a journey from supposed tangible factors (costs) to more intangible, tacit ones (personal interactions). From the time of Weber, who was first and foremost interested in finding the optimum location and constructed a rather unrealistic theoretical model of the economic environment, it quickly developed via Marshall, who, beside costs and labor quality, was already interested in socio-cultural phenomena. In more recent times, Porter's main contribution is that he approaches this mostly from the competitive, managerial perspective. For Krugman, it is again a story of costs, but combined with increasing returns. He stresses that history and accidents should also be taken into account. These scholars were interested in socio-cultural phenomena that have an influencing role in the way in which these linkages between the actors within the cluster are established and developed; but they mostly stated that it has to be taken into account. It was Granovetter (1973) who took an interest in the relationships between actors that are not operationalized in terms of costs and revenues. Sociology's contribution (although Weber was a sociologist as well as an economist and a geographer) was to develop methods to make tangible what was seen as intangible by researching these interactions between actors in a concentration of firms. In Chapter 4, where institutional arrangements are discussed, the question of how this can be done is addressed. Pigna (2014) does consider relationships, especially in the port city region. Given that the port cluster is in competition, *the port needs* the city to be stronger. So, the city must have attributes that benefit the port.

In the last two decades, the mechanisms that determine cluster development are receiving more attention. The static approach made way for a dynamic one in which a cluster emerges, grows, and finally declines unless measures are taken to extend its life cycle or to build a whole new activity from the remains of a former dominant industry. The level of heterogeneity of the existing activities determines the elasticity of the cluster. A feature that can be influenced by forces outside and inside the cluster is the cooperation of private and public entities. This cooperation can make an important contribution by creating a level of skills in the cluster population that adds to the potential for the emergence or sustaining of the variety of activities, hence increasing the cluster's flexibility to cope with external forces that entail threats or opportunities.

2.8 CLUSTERS AND SCALE: DEFINING THE CLUSTER, RELATIONS, AND PROXIMITY

Krugman considers agglomerations as a result of centripetal and centrifugal forces (Krugman, 1998), where the centripetal forces are those described by Marshall (backward and forward linkages, local labor market, and information spillovers (Marshall, 1920, p. 225)). The centrifugal forces are the immobile forces (land and natural resources), land rents, and external diseconomies such as congestion (Krugman, 1998, p. 8). Although Krugman rather exclusively links the centripetal forces to Marshall, the centrifugal force, land rents, is definitely based on Marshall's description of displacement of low-value activities in the cities by more value-adding service activities that lead to gentrification of urban areas (Marshall, 1920, p. 373). These forces are opposed to each other: centripetal forces fostering concentration and centrifugal forces fostering dispersion (Krugman, 1998, p. 9). Krugman (p. 10) wonders why the idea of location decisions based on access to markets and supply and why the fact that a producer's individual decision in itself enhances access to market and supply did not attract economists' attention until the 1990s. For him, the increasing returns based on economies of scale are crucial to cluster development.

The centripetal force is a circular causation: in a region, many firms create many different products, this attracts new workers (higher wages), so new consumers. The centripetal force is generated through a circular causation of forward linkages (the incentive for workers to be close to the producers of consumer goods) and backward linkages (the incentive for producers to concentrate where the market is larger). The motor of this process is self-reinforcing: increasing returns enhance economies of scale, which in turn enhance increasing returns, speeded up or slowed down by centripetal and centrifugal forces (Krugman, 1998). This was later illustrated by the circular process that leads to a differentiation in industrial core areas and lower-wage agricultural peripheries (Krugman & Venables, 1995). Studies in this field have been on different geographic levels: agglomeration on the level of neighborhoods, in the formation of cities, the disparities within a country or on a global scale, such as the North–South dichotomy (Fujita & Krugman, 2004). The main two implications of this thinking (known as the new economic geography) are: a. the importance of increasing returns, which helps describe and explain agglomeration; b. the emergence of discontinuous change, path dependency, and bounded instability (a concept used by Edelenbos, Gerrits, and Van Gils, 2008, in a port study on Rotterdam).

Nijdam (2010) relates the various manifestations of concentrations of economic activities to scale. Industrial districts are local and organized around the production

of the same product. Port clusters are on a larger scale and can go beyond the region, given that clusters consist of companies, organizations, and institutes that do not have to be located in the same region. The region itself is defined by its governmental jurisdiction. That is the difference between clusters and networks. Networks, seen as looser forms of organizations between companies, can span the globe. Visser too makes a distinction in terms of scale between clusters as spatial concentrations with firms that are related to one another but not necessarily need to cooperate, and networks that are a system of cooperation but that do not necessarily need to be in one another's proximity (Visser, 2000). These approaches pay too little attention to the different networks that can be distinguished. Certainly, there are networks that span the globe. The academic world consists of networks whereby specialists know one another while employed in universities that can be found all over the world; but individual organizations possess different networks with different goals, so to suggest that the network is by definition on a different scale than the region or a cluster is not correct. Attention must be paid to the local social network, which can go beyond the region because of some functional relationships (e.g. relationship with the government), but which is primarily strictly bound to local (regional or municipal) activities. There is a lack of studies that focus on the relationship between port actors and the municipal governance actors

One who does so is De Langen, who defines a seaport cluster as comprising all economic activities related to the arrival of goods and ships (De Langen, 2004, p. 85) and focuses on the cluster actors and their interactions in terms of governance (De Langen, 2004). His thesis is interested not only in the structural variables of the cluster, but also in the governance variables: "…. that it is a shift away from the 'mechanic' explanation of the performance of a cluster towards an explanation that incorporates behavioral aspects. Our study demonstrates the importance of governance in (port) clusters" (De Langen, 2004, p. 192). He pays attention to variables such as trust and education to assess cluster performance in terms of competitive strength. The behavior of these actors must be studied in a wider perspective than the cluster alone. The cluster interacts with the spatial entity to which it more or less belongs. Fujita and Krugman (2004, p. 160) state that "We need to unify the new geography models and traditional urban models, and study both the development of cities (having spatial extent) and industrial agglomeration in the same continuous space." So, the cluster must study its relationship to its spatial environment. Pigna's (2014) contribution is noteworthy in considering the relationship between port activities and their spatial locality. As stated in section 2.2, he pays attention to the relationship between cluster activities as performed by ports and their struggle for land in competition with the port cities (Pigna, 2014).

2.9 CRITICISM OF CLUSTER THEORY

Of course, there has been skepticism about the cluster theory as well. Motoyama (2008) argues that the theory is too descriptive and does not explain how a cluster emerges. In his opinion, a historical analysis should be incorporated when studying clusters. Porter pays lip service to the historical aspect by stating that historical developments and accidents are endogenous, and Motoyama considers this curious because, if this cannot be studied, clusters are not replicable and the theory as such cannot be used for regional policies (Motoyama, 2008, p. 360). Furthermore, the interconnections within the cluster are hard to measure, and for that he thinks that application (he speaks of a dialogue) with networking theories could improve the application (Motoyama, 2008, p. 353). The applied method for measuring these linkages with input/output tables puts too much emphasis on monetary values, whereas clusters are about interconnectedness, firm rivalry, and collaboration. The theory is too descriptive and static. "It is more important for policy makers to ask how and why cluster C in region D grew more in comparison with other regions. The statements of competition and collaboration do not grasp the dynamics of the regions. You need to know how the interaction was developed and organized in each region. The structure of the labor market, the horizontal interfirm relationships and the structure of information flows need to be investigated" (Motoyama, 2008, p. 359). Inherently, he thinks that the concept of applying competitive ability to a region is a wrong concept. Apparently, in his opinion, Porter sins against the need to analyze and extrapolate on the same level of aggregation. For Motoyama, a firm's ability to compete cannot be transferred to the regional level: "…regions are aggregated units and do not have their own will; therefore, they do not choose or pursue a differentiation strategy as firms. Or is it possible for a region, as a collective unit, including firms, governments, and universities, to form a differentiation strategy? Is there such a thing as regionally differentiated products? A niche market for 20 companies?" (Motoyama, 2008, p. 357).

In contrast, for Harrison and Glasmeier (1997), Porter's greatest contribution is especially the fact that he pays attention to the interdependence of clusters or sectors instead of individual companies in a region. They argue that he sees a role for firms to bridge inner-city economies to "...other firms located outside their neighbourhoods by becoming suppliers or co-venturers"; And "…. upgrading the skills of inner-city youth and other workers" (Harrison & Glasmeier, 1997, p. 31). They (in their case regarding the inner city) particularly criticize Porter for his neglect of the role of local governments and community-based organizations (Harrison & Glasmeier, 1997). This, however, depends on the scholar's perspective in observing the cluster. Porter,

interested in the competitive edge that a cluster can achieve, contends that discussing government is about external influences that more or less (in his opinion often the latter) affect how firms are created, organized, and managed (Porter, 1990a, p. 657). Indeed, Porter pays attention to government as an external factor and not one that really plays its part as an integral actor within the system.

Chapman criticizes the promotion of regional specialization because it has often resulted in a situation where "former territorially based advantages mutate into liabilities" (Chapman, 2005, p. 597), although Porter realizes this as well when he speaks of rigidity (Porter, 1998). Chapman, however, by stating that, is probably too eager to forget that specialization is also the basis for knowledge and innovation as long as there is an open mindedness to other developments created thanks to the existence of weak ties (Granovetter, 2005). This becomes even clearer if the strength of the regional concentration is not primarily in the existing concrete activities, but in the core competences from which these activities stem (Hamel & Prahalad, 1994, p. 227). For example, in Rotterdam, transshipment is the core competence that made it quite logical to aspire to a leading role in liquified natural gas (LNG) and biomass.

2.10 UNDERSTANDING CLUSTER DEVELOPMENT: A BALANCING ACT IN FOCUS AND DIVERSITY

To respond on this cluster criticism, the cluster concept must be further developed. As Porter's model is a static description, a more dynamic approach must be taken to be able to use the cluster approach for policy decisions aimed at influencing regional development. That requires a better understanding of how clusters emerge and how they grow, and how they decline or can be revived. The different stages of cluster development can be described in the way in which firms and products are described with a life cycle involving the phases of emergence, growth, maturation, and decline (Menzel & Fornahl, 2009). The life cycle concept is a useful tool to elaborate on the rather static approach of Porter's diamond and might provide an insight and an analytical structure for comparing the three port city clusters of Rotterdam, Antwerp, and Hamburg. So, for this thesis, researching specific port clusters, this might be a proper research perspective to explore. The cluster life cycle approach describes what Porter neglects: how do clusters emerge, what makes them grow, and how does this development proceed?

Like products, businesses and even industries can be described by life cycles (Menzel & Fornahl, 2009).[6] Life cycles experience different phases. The standard life cycle can be described as the introduction phase, the growth phase, the mature phase, and the decline phase (Figure 2.6). As shown in marketing literature, the cycle can be extended by adjusting costs and market position (in a commodity situation, this can be done by adjusting prices, which leads to loss of margin and in the end decline and extinction) (Kotler, 2013).

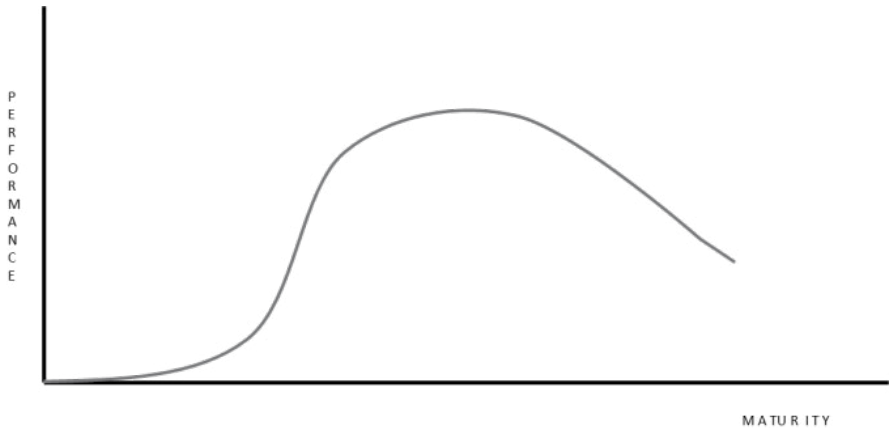

Figure 2.6 An industry life cycle (Based on: Kotler, 2000)

A more sustainable approach is innovation, whereby the current cycle is given a new growth possibility, so envelop curves occur (Figure 2.7).

For port regions, this reflects the situation whereby new activities based on current industries are initialized. In Rotterdam, for example, this is the situation with the initiatives on LNG or bio-based fuels. One might argue that this is a matter of perspective; LNG is something other than oil, but basically it is still in the business of energy. A chemist will say that oil as a resource cannot be compared to gas but, from the perspective of importing and handling crude resources, one might say that it is an extension of existing, labor-extensive port activities. And in this case, the same, low-value-adding one. An even more sustainable situation for the whole region is one where completely new activities are realized that are in line with changed supply and demand factors. These activities are often related to existing (and slowly fading) industries. The degree of relatedness defines whether there is a

6 Menzel and Fornahl (2009) have compared the different life cycles of companies that are clustered or that are non-clustered with the abstract or normal life cycle. This comparison shows interesting features of clusters that are of importance when assessing port regions.

situation as shown in Figure 2.7, or whether there really is a new industry with new competitors, new demand and supply, other substitutes, other entry barriers, and other switching costs (Figure 2.8) – in fact, the forces of competition as described by Porter (1980) when visualizing market attractiveness.

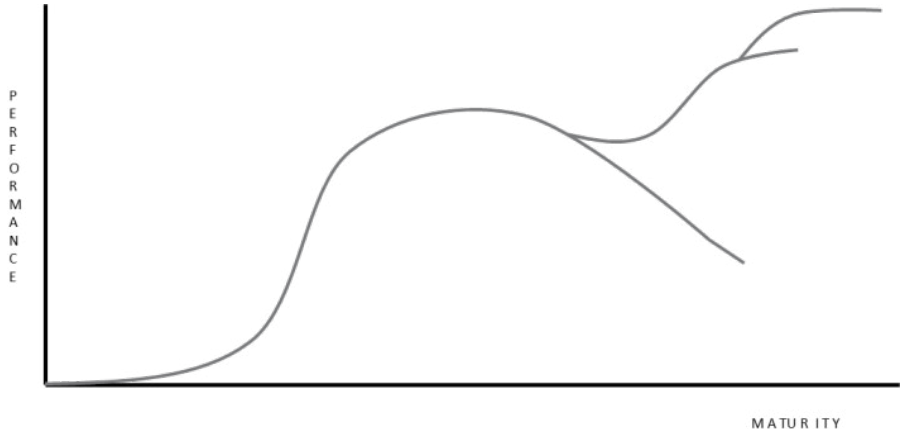

Figure 2.7 Innovations within the existing industry (Based on: Kotler, 2000)

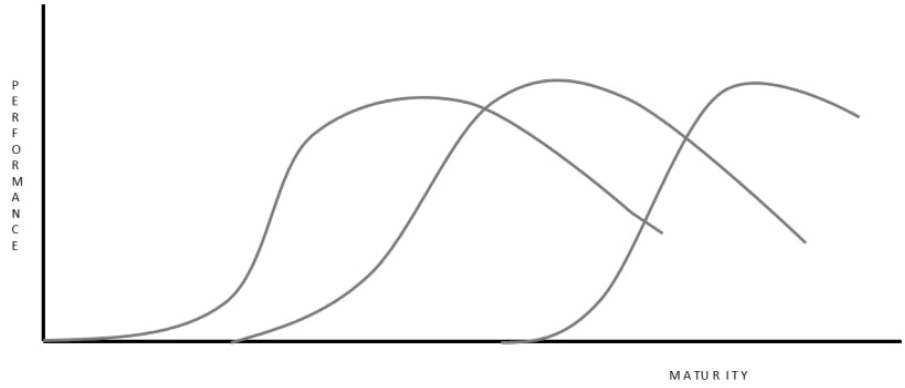

Figure 2.8 Initiating and developing new (related) industries (Based on: Kotler, 2000)

For port city regions in 2020, one can hardly speak of concentrated ports, given their spatial discontinuity as described in Figure 1.3. The changing global geo-political situation and trade balances will have an impact on the current activities in Western Europe. Port city regions such as Rotterdam, Antwerp, and Hamburg cannot afford to be self-satisfied with existing activities. Ports have long been measured in terms of tonnages and large, often labor-extensive plants. As life cycles experience their decline phase, it is important to initiate new activities, even before the current ones show signs of decreasing performances. In port cities, the separation of port and

city functions has often come at a price: an abandoned city and increased unemployment. It is interesting to see how these ports were able to create these new curves. One example can be seen in the expansion of MAPS as visualized in Figure 1.3. This has had various outcomes. Some port cities were apparently better equipped to attract and/or develop these activities that are vital for the city to prosper again.

As stated, these curves can visualize the development of products (for which they probably are best known), companies, industries, but also complete regions. The health of the cluster in terms of this ability to change its composition is called a phylogenetic view of evolution, in contrast to seeing the cluster's evolution from the ontogenetic view, whereby the development of a particular entity is researched (Martin & Sunley, 2011). This becomes particularly interesting when a region has the typical characteristics of a cluster, because clusters can have features that can possibly constrain their ability to reinvent themselves to avoid decline in the long run. Ports' success still determines the activities in their cities as facilitators of trade, bringing added value, providing employment (although, as Merk remarks, this is "… relatively marginal in comparison with the wider regional economy in which ports operate…") and acting as clusters for innovation, research, and development (Merk, 2014, p. 17).

Martin and Sunley contend that the life cycle model is not capable of providing a general theory of cluster evolution. They argue that a model is needed that does not have episodic discrete systems at temporal scales but has more flexibility to allow more different possible sequential trajectories. Therefore, they are in favor of the adaptive life cycle model, which responds more to its environment and allows for more developments within the "grand" life cycle structure. And even more: the adaptive model allows for other developments like decline after take-off without completing the other developmental phases. In fact, they wonder whether a universal model exists at all (Martin & Sunley, 2011, p. 1316). Their contribution is an enrichment and facilitates the identification of different paths, but it is still based on the life cycle concept. Consequently, a radical choice between these two approaches should not be made. The life cycle approach is appropriate to research the forces behind cluster development (Boschma & Fornahl, 2011), and the adaptive life cycle approach prevents us from viewing the complex reality as a process that is too linear.

2.11 HETEROGENEITY AND LOCKED-IN SITUATIONS

Comparing the three ports under study, one might wonder whether the position of Rotterdam, the largest port in Europe in terms of tonnage or TEUs and depending largely on the oil industry and container transshipment, will be able to cope with future changes. There are developments that affect the ports and their related port cities: the coming transition from fossil fuels to other sources of energy, the decreasing growth in container transport thanks to changes in world trade relationships, and the emerging new trade routes avoiding passage through the English Channel but using the Mediterranean ports of Piraeus, Marseille, Gioia Tauro, and so on. Using the life cycle concept, Menzel and Fornahl (2009, p. 205) attribute great qualities to the effect of being part of a cluster: "Companies in clusters grow stronger and innovate faster than those outside clusters". At the same time however, being part of cluster has its disadvantages, as shown in Figure 2.9.

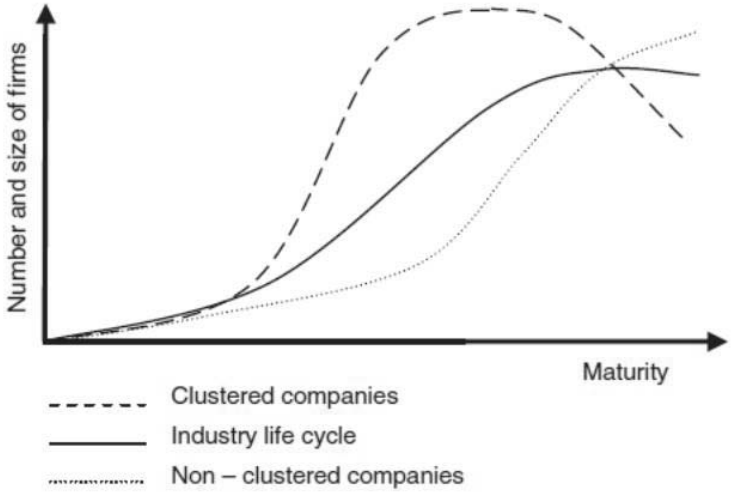

Figure 2.9 Clustered and non-clustered companies during the industry life cycle (Source: Menzel & Fornahl, 2009)

The advantage of being part of a cluster is experienced in the earlier phases when firms in a cluster grow more rapidly than non-clustered firms. However, Figure 2.9 also shows that, in the longer term, non-clustered companies survive better in terms of number and size (as Chapman, 2005, argues, as a result of the locked-in situation). This is also the position taken by Van Oort Weterings, Nedelkoska, and Neffke (2015) when explaining the interplay of specialization and variety. They consider a specialized economy vulnerable and that the cluster phenomenon would decrease economic innovations. The way to influence this standard life cycle and to prolong

the survival of the firms depends on the ability of the cluster to "adjust to a changing environment and that ability depends on the diversity of knowledge in the cluster" (Menzel & Fornahl, 2009, p. 210). This diversity, or heterogeneity, should not be too strong at the beginning of a cluster (as critical mass is then not reached for a take-off), but later, to avoid the locked-in situation, heterogeneity is needed. Menzel and Fornahl (2009, p. 216) call this the cluster paradox, which can better be seen as a balancing act between specialization/concentration – which is by definition a feature of the cluster – and heterogeneity, to prevent decline. Frenken, Van Oort, and Verburg (2007) describe this as related variety. When heterogeneity is absent, there is the risk of getting locked in, as evidenced by the Teesside chemical industry case (Chapman, 2005). Here, Chapman concludes that the region would have been better prepared if the Teeside economy had been more diversified. On the other hand, he remarks that there was a commercial fragmentation within the industry that prohibited an optimization of transaction costs. Within the industry, it would have been better if the individual enterprises had been part of a greater enterprise or if there was greater intra-corporate integration. It is interesting to remark in this regard that, in Germany, co-sharing – at least financially, but also in terms of information – is a typical phenomenon of the local economy.

So, clustering is needed for rapid growth and creating a base, but heterogeneity is needed to be able to adjust to changing environments. If the cluster is (at its best?) able to create new business curves like those depicted in Figure 2.7, the degree of heterogeneity can foster a situation as depicted in Figure 2.8 where new businesses (industries) are constantly created. This ability to generate new activities can benefit port cities as they can be the location that suits these activities: close to existing industrial and commercial activities, likely inclined towards, and capable of, improving infrastructure (spatial, social).

How does that apply in the most important port cities in the Le Havre–Gdansk Range? Merk (2014, p. 81) and also Lam and Zhang (2011) showed those activities in the maritime cluster in which a port has a competitive advantage in (Table 2.1).

Table 2.1 Maritime cluster composition in main-port cities

Maritime advantages	Hamburg	Hong Kong	London	New York/ New Jersey	Oslo	Piraeus	Rotterdam	Shanghai	Singapore	Tokyo
Port	O	O					O	O	O	
Marine insurance			O		O				O	O
Financial service	O	O	O	O	O	O		O	O	
Ship registry	O	O	O		O	O			O	
Shipowners, Operators & Managers		O	O		O	O	O		O	O
Ship classification society			O		O					
Ship agency and forwarding			O				O	O	O	
Ship brokers			O		O	O				
Legal services		O	O			O			O	
Ship building & repair	O	O					O		O	
Marine personnel				O			O	O		
Research , education & training	O	O	O		O		O	O	O	O
Information and communication technology (ICT) Services		O	O	O		O	O		O	
Regulators: Maritime Organisations / Associations/exchange market, etc.			O		O		O			O
Governmental support	O							O	O	
Maritime culture and heritage	O		O	O	O	O	O			

Note: "O" denotes maritime clusters have the competitive advantages in the particular aspects.

Source: Lam and Zhang, 2011 operators, & managers; education, &; Maritime organizations/associations;

Regarding the ability to attract MAPS, the position of the city of Rotterdam in 2011 compared to Hamburg is less apposite. Besides paying attention to new life cycles that are reinventions of the old ones (such as biomass instead of oil) and so creating those enveloped curves, Rotterdam will also have to pay attention to the creation of new life cycles, for example by stimulating the location of highly skilled MAPS. Various reports from consultancy agencies confirmed this situation. In comparisons of cities on their maritime services, in 2012 Rotterdam was not included in the top ranking, as Table 2.2 shows. In Tables 2.2 and 2.3, it is remarkable that Antwerp is not mentioned at all when it comes to the top 5.

Table 2.2 Ranking port cities on maritime services and operations 2012

Rank	Shipowners and shipping operations	Maritime finance	Maritime law and insurance	Maritime technology and competence	Overall rank
1	Oslo	Oslo	London	Singapore	**Singapore**
2	Singapore	New York	New York	Hamburg	**Oslo**
3	Piraeus/Athens	London	Singapore	Shanghai	**London**
4	Tokyo	Singapore	Hong Kong	Oslo	**Hamburg**
5	Hong Kong	Hong Kong	Oslo	Tokyo	**Hong Kong**

Source: Menon Business Economics, 2012

Only seven years later, this situation had changed significantly for Rotterdam, as Table 2.3 shows:

Table 2.3 Ranking port cities on maritime services and operations 2019

Rank	Shipping	Maritime finance and law	Maritime technology	Ports and logistics	Attractiveness and competitiveness	Overall rank
1	Singapore	London	Oslo	Singapore	Singapore	**Singapore**
2	Athens	New York	London	Rotterdam	Copenhagen	**Hamburg**
3	Hamburg	Oslo	Hamburg	Hong Kong	London	**Rotterdam**
4	Hong Kong	Hong Kong	Busan	Shanghai	Rotterdam	**Hong Kong**
5	Shanghai	Singapore	Tokyo	Hamburg	Hamburg	**London**

Source: Menon, 2019, cited in Jacobsen et al., 2019

As the newest Menon report of 2019 shows, the overall ranking has been influenced by the presence of two new categories (port and logistics, and attractiveness and competitiveness) and combining two former separate categories (maritime finance, and maritime law and insurance). Nevertheless, it is striking how Rotterdam has improved its position. This is partly because the Menon database includes not only the number of firms, but also the value of loans, which increased in 2017 by 50% consequent to the activities of ING and ABN AMRO (Jacobsen et al., 2019, p. 24). The expertise on this subject is still very much more prominent in Hamburg (p. 27). Rotterdam's high ranking on attractiveness is a consequence of its ranking on the Global Entrepreneurship Index (p. 38). The assessment of this aspect also showed that Hamburg especially scored less on being an entrepreneurial center (p. 40). In this 2019 overall ranking, Antwerp's position is a modest number 15. Table 2.4 provides a more detailed variety of MAPS in the three ports under study.

Table 2.4 Maritime advanced producer services in Rotterdam, Hamburg, and Antwerp

Activity	Hamburg	Rotterdam	Antwerp
Marine equipment	252	120	39
Shipowners	3221	528	56
Maritime organizations	30	39	23
Consultants	42	47	14
Maritime lawyers	30	26	9
Insurance	21	14	5
Port agents	15	16	52
Maritime education	8	5	5

Source: World-ships.com 2016 (accessed 23 January 2016)

So, Rotterdam, which has a long history as the largest port in the world, and still as the largest port in Europe, was apparently not as capable as Hamburg of attracting MAPS, as one would have expected of the largest port in Europe. In financial services

and ship registry, it does not match Hamburg, according to these figures. This is in line with the results of studies ranking maritime world cities (Verhetsel & Sel, 2009; Verhetsel & Ballіauw, 2015). In both studies, Hamburg by far outranks Rotterdam regarding connections with other cities – connections measured in terms of service level and the Globalization and World Cities method (GaWC classification method). Verhetsel and Ballіauw (2015, p. 57) conclude that "For policy makers the important suggestion of this study is that, to become an important maritime world city, attracting at least some headquarters and a range or regional offices [like Antwerp does] is necessary. …In the end this should result in a transition from a main port to a world city." Rotterdam is excellent at transporting and overhauling cargo, crude oil, and natural resources (iron and coal). Furthermore, the petrochemical industry is strongly represented in Rotterdam, as is dredging and shipbuilding (if the region is also included). However, these activities might be characterized by a decline in growth and future opportunities. In addition, these activities are sensitive to the developments anticipated to be ahead. Nonetheless, one can say that the Rotterdam economy, from a world city point of view, has recovered remarkably on the city index but is still outperformed by Hamburg. From a city point of view, Hamburg, ranking high on the abovementioned classification methods, could be in a better position to cope with these transitions. The development of the port cities can be compared by reference to their life cycles, but also by comparing the variety in industries and the way in which they were, and can be, influenced by the city itself in subsequent years.

2.12 Conclusion

For this thesis, the city is part of a cluster and not a separate entity. Like in Pigna (2014), the city is considered as an inextricable part of the port. Or, from the city's perspective: the port is an inextricable part of the city. It was and is heavily influenced by the activities of port firms, and, vice versa, the city influenced and still influences the development of the port. Various actors (organizations and firms, but also individuals) have played their part in this. Krugman shows that one has to examine centripetal and centrifugal forces to understand the developments in the cluster and their spatial outcomes. As described in the problem analysis, the spatial outcome for ports is indeed a result of these two opposite forces, and different outcomes have been achieved in different regions.

How this developed and what that meant for the port–port city relationships are illustrated when the three port regions Rotterdam, Antwerp, and Hamburg are historically described in Chapter 8. For now, this review of cluster studies was necessary to show the development of ideas concerning the way one can look at

concentrations of industries. This study defines a cluster as a region that compromises the zone of port-related industrial activities and the associated city that can only be completely understood in its development (and the result of that) when the interactions between firms, intermediaries, and public representatives have been researched.

Commonalities and complementarities that are present in a particular spatial environment are core features of Porter's definition of a cluster (Porter, 1990a, 1998, 2000, 2002). In this environment, the result is interconnected companies and the presence of associated institutions. As scholars have emphasized, the relationships between actors, institutions, firms, and government organizations should be studied in relation to not only the concrete economic outcomes (input/output models), but also the more intangible factors (Marshall, 1920; Alberti, 2001; Porter, 2009; Dicken, 2009; Nijdam, 2010; De Langen, 2004; Chapman, 2005; Neffke & Henning, 2013; Menzel & Fornahl, 2009; Granovetter, 2005).

The cluster approach provides a tool for distinguishing relationships within a spatial environment concentrating on activities that are related to one another in terms of features they have in common or in which they complement one another. In this way, an environment is created in which companies and institutions associated/related with them can enhance the performance of the region. In port regions, the interconnected port companies have migrated from former locations within the city to more peripheral locations within the port city region. Their place is taken over especially by more or less associated institutions within the port city. This thesis is interested in how this process has developed and the economic effects for the city. So, the emergence of the cluster, particularly the interrelationships between the various actors, is relevant. Therefore, this model provides us with the next objectives:

- To study the way in which these commonalities and complementarities between selected port actors are established and strengthened by private and public governance;
- To study the outcome of the nature of these relationships in terms of benefits for the whole cluster, i.e. the port region.

Concentrations of economic activities can enhance prosperity (Porter, 2000; Frenken et al., 2007; Menzel & Fornahl, 2009). Cluster theory can assist in the design of public policy to enhance this prosperity by stimulating clusters. However, it is necessary to have a thorough insight into how clusters function and into the current phase of these concentrated activities, as Menzel and Fornahl (2009) show. What is the

heterogeneity of more mature clusters, and how well do we stimulate convergence at the beginning of clustering activities to enhance cluster growth? The ports in the Le Havre–Gdansk Range are at first glance clusters of port-related activities. A closer look shows differences in the way in which these clusters have developed their convergence and heterogeneity. It is interesting to ascertain in what way public authorities have played a role in the different phases of cluster life cycles that have led to different levels of lock-in in certain industries or have been able to regain a certain level of heterogeneity to enter new growth stages, because "it is the utilization of heterogeneity between clustered and non-clustered companies that results in different life cycles" (Menzel & Fornahl, 2009, p. 219). Understanding these differences in heterogeneity helps to evaluate the conditions in terms of welfare for the cluster environment of ports, i.e. the port cities. The presence of a common view in both industry and governmental organizations could influence the way in which the benefits of the cluster's economic outcome is achieved and invested in the cluster on behalf of all the actors. The concept of shared values is an instrument to determine whether such a common view exists. It is even still to be seen whether the three regions under study – Rotterdam, Antwerp, and Hamburg – really had a proactive cluster policy and whether this policy reacted to developments from outside (demographic, economic, social, technological, environmental, and political).

The approaches and models discussed above are useful for describing and understanding the development of port cities from the past to the present and their future opportunities or constraints. As described in Chapter 1, the current situation in ports can sometimes be seen as a schism between the port activities and the city from which these activities originated – a schism in terms of spatial location and functionality. Sometimes, because this schism is not always obvious, as in Hamburg, or functionally speaking, because there can still be a lot of port-related variety in these cities. The concept of clustering directs us to the interplay of actors, commonalities, and complementarities. The idea of concentration and heterogeneity, the degree of locked-in clusters, force us to pay attention to diversity in relation to the development of the port to present times. Related variety and skill relatedness are concepts that help us to evaluate the situation regarding the future. The concept of shared values is an important one to take into account as one of the concepts to evaluate the clusters port/port city under study as they enable, even enhance local cluster development. All be it a cluster characteristic, in fact is a sensitizing concept as well and will be dealt with as such. But for now it will be summarized as a result of the exploration of the body of knowledge cluster development.

This creates the next categories of cluster characteristics that will be used for the empirical research as shown in Figure 2.10.

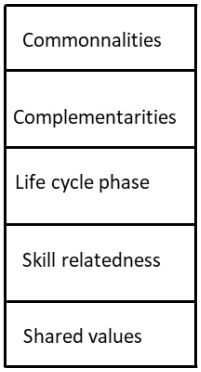

Figure 2.10 Characteristics of cluster composition