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Building a bridge between Port and City: Improving urban competitiveness of port cities

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SUMMARY

This research paid attention to the relationship between port activities and urban competitiveness, as well as how to improve urban competitiveness of port city. Historically, Ports were a main driving force of urban development, and this point could be proven by the development of both emerging port cities in Asia, and the mature transportation center in Europe. However, the developing trend of the port city development in recent decades had shown two different directions. The first one was separated urban area from port area to seek for diversity development that does not depend on port activity and port-related industry, while the second strategy is developing maritime industry and seek for better positon in global port network. The conflicts between port and city in functional and spatial aspects generated the significance of this research, which was to study port-city relationship and explore the determinants of urban competitiveness of port cities, and consequently the application of the analysis was used to provide policy recommendations to municipality of port cities.

The literature review provided theoretical support for this study. Segregation of a port area and an urban area due to functional conflicts were confirmed in general models of port-city relationship, However, there is surely positive and negative impacts of port activities and port-related industries in economic, environmental and social aspects of port city. Because of these impacts, different development strategies were adopted by port cities all over the world to deal with this issue. However, the selection of policy recommendation depended on whether port activities had positive effect on urban competitiveness and what are determinants of urban competitiveness of port city, as the result, FDI and container route established urban network and port network separately for social network analysis to test the relationship between port activities and urban competitiveness. Then, valued FDI (Foreign Direct Investment) was the indicator of urban competitiveness. Port characteristics and urban characteristics were independent variables to explore determinants of urban competitiveness.

The first section was a descriptive analysis done by social network analysis; the structures of an urban network and a port network were analyzed by centrality and cohesive subgroup analysis. Following this, the relationship between two networks was tested by QAP correlation test. In the second stage, the regression model of port cities and non-port cities tested whether port cities have an advantage over general cities. Afterwards, the regression model with only port cities was established to seek for determinants of the urban competitiveness of port cities. The final stage compared Rotterdam and Ningbo with cities in the same regions, and the strengths and weaknesses of these two selected cities were discussed in order to provide policy recommendations to municipalities.

As the result, there was positive relationship between port networks and urban networks, namely that the cities in the center of port networks were also in the center of urban networks. The second result was that when comparing urban competitiveness between port cities and general cities, port cities were weaker than general cities, and then, urban and port characteristics had both positive and negative impact on urban competitiveness of port city. Finally, though Rotterdam and Ningbo were in the center of port networks, they had

significant weakness in comparison with leading cities of their metropolitan regions, these result would suggest municipalities of port cities to improve business environment based on locational advantage, and strengthen their position in port network to development maritime industry. However, negative impacts of port characteristics such as pollution needed to be moderate.

Key words: Port Cities, Port-City Relationship, FDI, Urban Competitiveness, Port Competitiveness.

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Abbreviation

FDI:	Foreign Direct Investment
QAP:	The Quadratic Assignment Procedure
OECD:	Organization for Economic Cooperation and Development
APS:	Advanced Producer Services
MNC:	Multinational Corporation
GUCR:	Global Urban Competitiveness Report
YRDR:	Yangzi River Delta Region
OLS:	Ordinary Least Squares
DW Test:	Durbin Watson Test
GDP:	Gross Domestic Product
WPI:	World Port Index
TEU	Twenty feet Equivalent Unit
MIDAs:	Maritime Industrial Development Areas

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1. INTRODUCTION

1.1 Background

In human history, port was an important locational factor of cities, and thriving ports were the major driving force of development in corresponding port cities. If a panoramic view of the global cities' development history could be taken, it was easy to find cases in which development of a port city was parallel to the prosperity of a large port. According to the research done by Organization for Economic Cooperation and Development (OECD), there was a significant overlap between the world's largest metropolises and the largest ports (OECD, 2013). This strong relationship between the port and its direct hinterlands (port cities) had lasted for centuries in Europe. For example, the transformation of Rotterdam from a fishing village to a global port city started from the 14th century. In another region of the world, the rising up of Chinese emerging port cities, such as Ningbo and Shenzhen, happened during the last three decades.

Rotterdam and Ningbo were two typical cases of port cities. As a major hub port in Europe, Rotterdam located in the south wing of Randstad, which was the major city region of the Netherlands. Rotterdam was not only a transit center, but it was also a prosperous city with great innovation capacity. Indicators of port performance, such as the average annual volume growth which was 4.4% in the period from 2002 to 2011, prove that Rotterdam is the biggest port in Europe and the second biggest port in the world. Moreover, the metropolitan area of Rotterdam also benefited from the booming of port activities. The multiplier calculated by OECD showed that 1 Euro spent in the port will generate a 0.13 Euro of extra demand from urban areas, which is also a larger impact compared with other ports (Merk and Notteboom, 2013).

Another vivid story of a port city happened in the eastern coastal area of China. As an emerging port city in the Yangzi River Delta Region (YRD), Ningbo was becoming a threat to Shanghai, which was the traditional central city of YRD Region. Furthermore, with the advantage of having a port, the metropolitan area of Ningbo was also changing into a developed industrial base of eastern China. According to the further development plan of the Ningbo Port, the municipality of Ningbo was trying to reap economic welfare brought on by port activities such as attracting international investment to improve port facilities and urban infrastructures. All in all, the urban vision of Ningbo is not only as a regional transport center, but also as an international modern city that depends on the natural condition of their marine economy.

In short, it was obvious that the potential of locational advantage is impossible to be ignored. The main advantage was the added value generated by the port-related industry. Based on the research of Yochum and Agarwall (1987, 1988), a port-related industry could be classified by three categories: the port-required industries included transportation service and port service such as terminal operations and stevedoring; the port-attracted industries, which were firms engaged in import and export trade, and the port-induced industries, which were firms in other sectors taking advantage of transportation hub to expand their markets. Moreover, the

synergetic cluster affected also emerges in port cities, which would promote the development of non-port industries linked with ports by backward linkages. With the exception of the second industry, the clusters of APS firms within the fields of finance, insurance and law also appeared in port cities (Jacobs et al, 2010). Furthermore, the costal lines of a port city provided the potential to attract tourists and to develop the cruise industry and tourism.

1.2 Problem Statement

As time goes on, the strong relationship between ports and port cities was becoming weaker due to the conflicts between the port area and the urban area. Holye (1988) tested this trend in his Port-City Evolution Model and was proven by some empirical studies (OECD, 2013). There were two reasons that cause this trend.

In the spatial aspect, the conflict of land use pattern between port economical activities and urban development caused the geographic segregation between ports and port cities. The reason of this segregation could be explained by two dimensions: the economic dimension and the environmental dimension. Regarding the economic dimension, an agglomeration effect of economic growth would be negatively affected by adjacent port areas. The pressure of having a transport system also generated congestion costs for economic activities which came from the delay of transport flow (Yingigba Jaja, Chioma, 2011) and the increasing rate of traffic accidents (Giuliano and O'Brien, 2008). The environmental dimension was concerned with the impact generated from economic activities; these impacts, such as air emissions, water quality, soil, waste, biodiversity and noise, will lead to health issues for urban populations, especially the people of a lower socio-economic status.

In the economic part, the positive externality of portal economic activities was becoming a main constraint of the development of port cities. Ports provided several kinds of economic benefits for the development of port cities such as added value (Merk et al, 2011) and lower transaction costs (OECD, 2013). However, a large proportion of the economic benefits were spillovers to other cities and even other countries. Using Rotterdam as an example, the scale of the city could not accommodate all of the economic activity of Rotterdam Port, thus the indirect economic benefit was taking place in other European countries such as Germany and Belgium (OECD, 2013). For a single port city, it was impossible to foster itself as the unique hinterland for the port due to the limitation of land resource, the weakness of the logistic system and the Siphon Effect of a central city.

This conflict of a port-city relationship led the need of a different strategy of urban development. As members of a certain city region, port cities must make the choice concerning their urban development strategy in order to enhance urban competitiveness. They could make full use of natural condition or they could separate the port area from the urban area. The choice of strategy depends on the answer of following questions: does a port city have advantages in comparison with general cities, whether port prosperity has positive influence on urban competitiveness, and what the main factors of urban competitiveness of port cities are. Furthermore, the impact of the port on the economic development of a port city seemed to be opposite in different local and regional contexts (Ducruet, 2006). With this point in view in mind, seeking for the determinants of this difference was also an essential

task for this study, and policy recommendations would be given to the port cities in different regions as well.

1.3 Research Objective

There were three research objectives derived from the problem statement above.

The first objective was to test the relationship between port activities and urban competitiveness. This research would explore the structure of networks made up of ports all over the world chosen based on their capacity to attract investment and their level of port activeness. To measure the two factors, network data used include data on container route, as well as the structure of networks of corresponding port cities which have jurisdiction over specific port by using Foreign Direct Investment (FDI). Afterwards, the relationship between port networks and port cities networks would be examined to show the strong link between port activities and urban competitiveness.

Based on former procedure, the structure of networks and the position of each port city in the network were identified. Logically, the second objective was to seek for the main determinants of urban competitiveness of strong port cities. In this section, whether port city has advantage in attracting FDI compared with general city would be tested to ensure the positon of port city in global urban network, and then local factors of chosen port cities as well as characteristics of ports were under observation.

The third objective was to make full use of the comparative advantage of ports and provide policy recommendations to municipalities of port cities. In order to provide clear statements of policy recommendations, Rotterdam and Ningbo were used as comparable cases to discuss how to improve urban competitiveness of port cities.

1.4 Research Question

The main research question was:

How can the advantages of ports be internalized to improve urban competitiveness of port cities?

A. For global port cities, whether port network measured by container route has significant relationship with urban network measured by FDI?

B. Among port and urban characteristics, which are the determinants that strengthen the urban competitiveness of port cities?

C. Based on the former analysis, what kind of competitive and complementary recommendations could be provided for the development of port cities?

1.5 Significance of the study

This research consisted of three sub-questions; each one had a separate but correlative objective, and the combination of these three parts would provide much significance to this

study. According to the research question, this research could be divided into the following three stages.

In the first stage of this study, the significance was to understand the position of port cities in the urban network as ranked by FDI. This stage would also investigate the relationship between the prosperity of a port and the development of corresponding port cities. By the end of this stage, the importance of a port in the reinforcement of urban competitiveness will be deeply comprehended.

The significance of the second stage was to explore the influencing factors of urban competitiveness of a port city. Based on the result of the first stage, the relationship between the prosperity of a port and urban competitiveness of port cities were proven by network analysis. Thus, the next step was to seek for the determinants of urban competitiveness of port cities; local factors and indicators of port competitiveness would also be included in this research. In addition, this stage would understand whether port city had advantage over general city as basis of policy recommendation.

The final stage provided policy recommendations to the municipality of port cities based on the results from the former stages. In this step, Rotterdam and Ningbo were chosen as comparable cases, and this stage explored their position and importance in port cities network and would give separate suggestions based on the result in second stage. Furthermore, two comparable cases could provide beneficial experiences to each other.

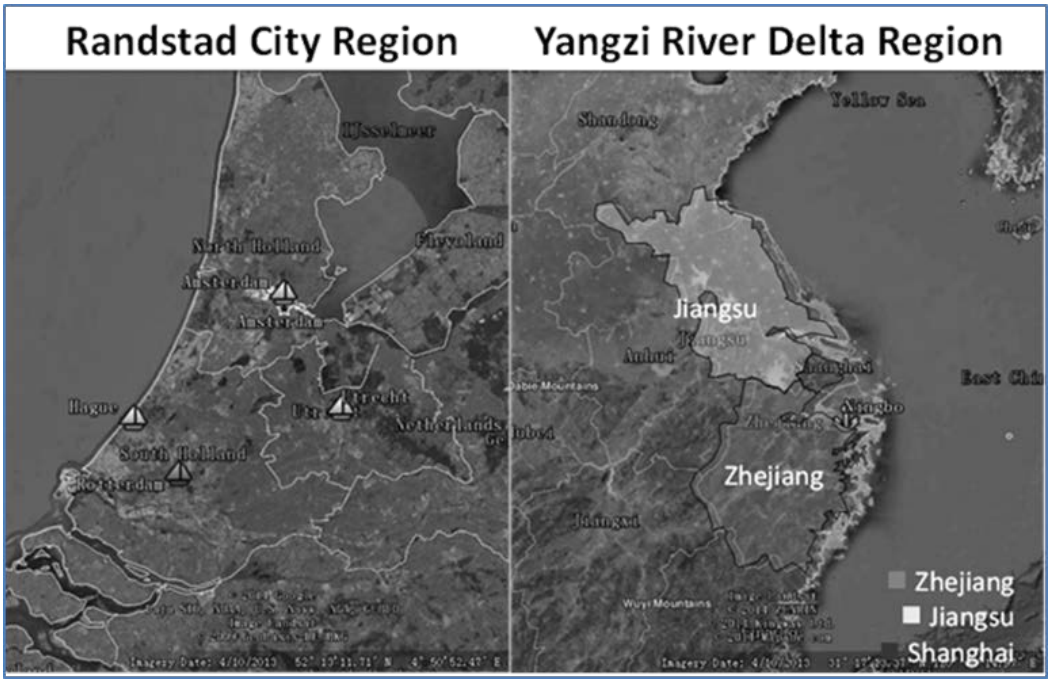
1.6 Scope and Limitations

The research scope was divided into three dimensions, which were global, regional and urban dimensions. In the first two research stages, the scope of research dealt with global and regional dimensions. The cities selected as samples for network analysis and regression analysis were 50 port cities as ranked by container throughput in 2012 and 50 general cities as ranked by foreign investments. The network analysis illustrated the structure of an urban network and a port network, and the analysis also tested the relationship between port activity and urban competitiveness. Regression analysis sought for the determinants of urban competitiveness of port cities and examined whether a port city has an advantage in urban competitiveness over general cities.

In the third stage, the result of the previous analysis was applied to studying urban development, and the scope of research would zoom in to specific port cities: one was Rotterdam in Western Europe, the other one was Ningbo in the YRD Region. The reason for choosing these two cities was their similar roles in their city regions. Specifically as logistic centers and trading hubs, Rotterdam and Ningbo played an important role in city regions. However, they were not central cities in their city regions; Shanghai was the leader of YRD region, and Amsterdam was the center of Randstad city region. In this situation, the development of Rotterdam and Ningbo were limited by central cities. Therefore, finding right position in city regions and adopt appropriate strategies in enhancing urban competitiveness was essential to municipalities of port city. The network analysis would show the position of the two cities in urban and port networks, and the regression analysis would identify the

strengths and weaknesses of Rotterdam and Ningbo in order to provide policy recommendations.

Figure 1 City regions of Ningbo and Rotterdam (Source: Author, 2014)



The limitations of this research were centered on data collection and analysis. The first difficulty was the collection of a large amount of data. In this research, the data used for network analysis were network data of FDI and container traffic (number of container route and transshipment condition). In addition, factors about port competitiveness and urban competitiveness needed to be collected from authoritative sources. In order to ensure reliability, the data is taken from the following sources: the data of urban characteristics is gathered from the Global Urban Competitiveness Report (GUCR, 2011); the port attribute data is obtained from World Port Index (WPI) database; FDI data is collected from Financial Time, and port network data was collected from Linescape. Other data also have clear and authoritative sources which will be listed in detail in Chapter 3.

2. LITERATURE REVIEW

2.1 Introduction

This research will focus on the coordinated development of a port city in a certain urban cluster. Hence, the literature review will present the articles using three main topics as the framework.

The first topic is the relationship and the pattern of interaction between a port and a port city. Obviously, the relationship between them is changing during the process of development, and the relationship is also changed by the context of a city and its region. In this part, the general pattern of their relationship will be provided for a deeper understanding of the history and the trend of the development of a port city.

The second section focuses on the positive and negative impacts. This aspect will find that port activities will affect the characteristics of urban competitiveness, such as its economic, social and environmental aspects. From this review, we can obtain the support of the research which is designed to build the indicator system.

The third aspect deals with urban competitiveness. Since port economic activities will provide diversified potential for the development of a port city including a lower transaction cost, improving added-value and promotion for development of port-related industry are all choices of the developing track for a port city. Therefore, the problem left for investigation is to search for a model to measure the competitiveness of a port city through a review of the urban competitiveness theory.

Finally, based on the literature review, a conceptual framework will be provided to conclude this chapter and support the design of this research.

2.2 Relationship between a Port and a Port City

The relationship pattern of a port and a port city is transforming with the passage of time and with different contexts. Nevertheless, one certain thing is that port activities have bi-directional impacts on a port city, and this point contains both positive and negative impacts. On the contrary, as a direct hinterland, a port city is an original driving force of port development. Though the linkage between a port and port cities is becoming relatively weaker (OECD, 2013), a port city is still be able to make full use of its locational advantage of having a port, enforce its urban competitiveness, and maintain the sustainable development of a port and a port city (C Ducruet, 2006).

2.2.1 Definition of a Port city

An extreme expression of the conflict between a port and a port city is that “the port city is robbed of its maritime character and becomes little more than a city that happens to be located on the shoreline” (Frank Broeze, 1985). The function of a port city was defined as not only a base of foreign trade, but also “centers for the introduction and diffusion of new industries”, in other words, a port city should seek for diversified development on the basis of locational advantage. This understanding clearly illustrates how the trend for the development

of a port city differs from the traditional view which believes that a port should be the first cause of urban development and also the organizational principle for the institutional establishment of a port city (Frank Broeze, 1985). In reality however, a port is only one of the driving forces of urban development; conflicts between the function of a port and a port city has become common issues.

2.2.2 Port-City Relationship Models

First of all, an overall perspective will be given to understand the relationship between a port and a port city. It is undeniable that a big part of global cities originate from the prosperity of port trade. If observing the geographic distribution of global cities, a large number of cities own a large port; even if the port and the city are separated from each other, the effects of port economic activities still exists in the city (OECD, 2013). On the other hand, there is another point of view with a more pessimistic attitude about this relationship: due to the conflict which comes from mismatched functions between a port and a port city, a port is now regarded as a foreign body outside of the urban system. The positive economic effect will spill over to a larger region beyond the administrative boundary of a port city, but the negative impacts will be locked in urban area (OECD, 2013).

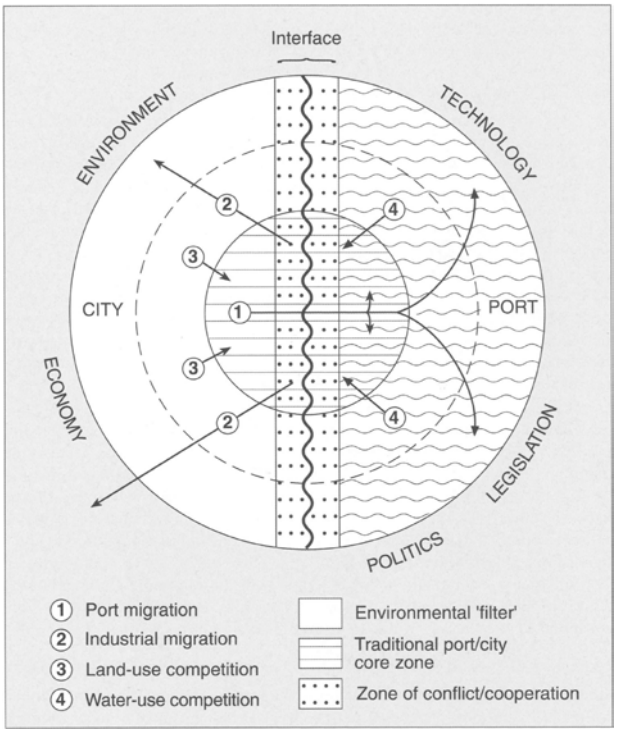
Two opposing views show the dualistic impact of a port on a port city. However, there is no permanent principle that dictates what a port-city relationship is because the trend is changing over time by the advancement of technology and economic needs. The main trend in the last few decades is that a port and a city have been disassociated from each other. Brian Holye (1989) set up the Port-city Evolution Model based on an earlier case study which illustrates the spatial evolution of a port-city relationship. In this model, the relationship between a port and a city is divided into 6 stages as seen in Figure 1. In brief, the relationship can be described using three words: merge, torn and rebuild. In the earliest stage, a port and a city are closely related to each other in their spatial and functional aspects. Then, the advancement of technology generated the needs for expanding the port area and accelerated the separation of the port and the urban area. However, the trend of isolation between a port and a port city tends to be transformed by the redevelopment of a waterfront and a globalization wave, thus a new mode of port city relationship is needed to be set up (Holye, 2000).

Figure 2 Port-City Evolution Model (Source: Brian Stewart Hoyle, 1989)

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 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 the waterfront		1970s-1990s	Large-scale modern port consumes large areas of land/water space, urban renewal of original core

The Port-city Evolution Model looks at the port-city relationship in a general perspective. In a more microcosmic point of view, it is easier to find a fierce conflict in the spatial aspect due to different land use patterns and functional incompatibility. In Holye's (1988) Port-city Interface Model, the author set up a spatial model for present-day waterfront development. In this model, port-related industries tended to move away from the port area because of environmental concerns and labor concentration. In spite of this migration, some competition for vacant space and access to water bodies took place between port activities and other urban functions such as housing, commerce and recreation. This model is useful to urban planners and decision makers for viewing the problem in a more comprehensive and specific perspective.

Figure 3 Port-city Interface Model (Source: Brian Stewart Hoyle, 1989)

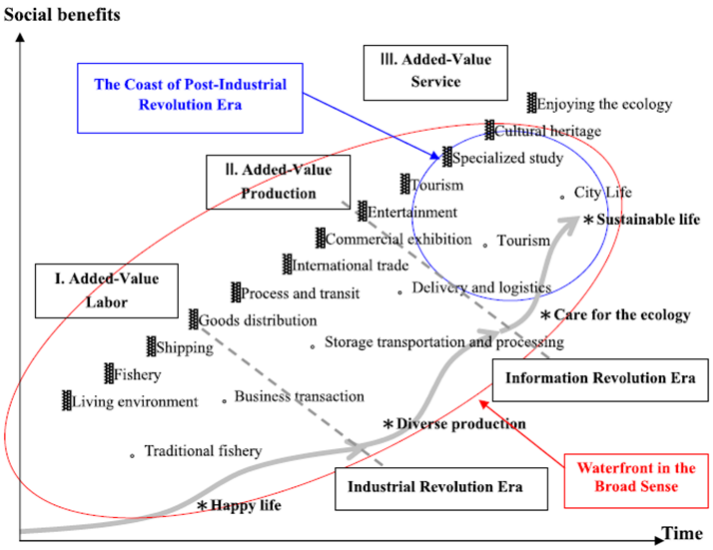


Based on the achievement of Holye, numerous case studies have been conducted to support these two models. In these studies, it is easy to notice that there is no fixed mode in the redevelopment of a port-city relationship. According to the case study of Halifax, Canada, both a superior natural condition and a relatively moderate competition with other ports caused differences between the port-city relationships. The regional study of a port-city relationship also shows that the level of facilitating urban development by port prosperity is affected by the regional context. According to Lever's (1995) study of European cities, the growth rate of port cities is slower than non-port cities since the mid-1980s; it seems that port prosperity did not provide a stronger driving force to urban development. However, research done by Wang and Olivier (2003), which focused on port cities in China, indicate that the gap of development between coastal port cities and inland general cities has been widening.

Apart from spatial models, the definition of a port-city relationship in economic aspects is given by Alvin Toffler (1980). In his point of view, the whole world is changed by the improvement of information technology during the information era. Inevitably, the development of a port city is also affected by this inevitable trend. Murphy's (1989) study claims that through urban diversification, a port city can dispense with interdependence on port trade and become a competitive general city. In his urban evolutionary model, he states that a port city starts from having a high dependence on port economic activities to enhance urban competitiveness. Then, port-related industries are attracted by such an environment and an industrial city will be built with the port as the core area. In the final stage, a port city will release itself from its port by developing an advanced service industry (Charlier, 1988).

Wen-Chih Huang, et al. (2011) developed three stages of port city development based on Toffler's idea and on earlier research about port city classification (Cicin-sain et al. 2000; Vallega, 2001), in which the development of a port city is divided into value-added labor, value-added production and value-added service. In the first stage, fishery, living and shipping are the main activities. In the second stage, port-related industries such as storage, processing and logistics are the pillar industries. In the final stage, the port city is no longer associated with environmental pollution and functional conflicts with port activities and it pay more attention to research, innovation industries and recreation. This transformation in these three stages has taken place all over the world, especially in Asia, Australia and Africa.

Figure 4 Three Stages for Port-city Development (Source: Wen-Chih Huang, et al. 2011)



2.2.3 The Strategy to Rebuild Port-City Relationship

Current research provides the latest study on the developing strategies of a port city; in the study conducted by OECD (2013), there are five different strategies that will be effective in rebuilding the port-city relationship and in enhancing the urban competitiveness of a port city.

Table 1 Main policy options to increase local port benefits (Source: OECD, 2013)

Policy option	Related sectors	Instruments	Examples
Maritime clusters	Logistics Maritime services Shipbuilding/repair	Developmental support Fiscal incentives/grants Coordination/information Human capital matching	Singapore Hong Kong
Industries	Industrial ecology Renewable energy	Spatial planning Investments	Rotterdam
Waterfronts	Tourism/recreation Food Events industry	Master planning Project implementation Incentives/investments Synergies with port	Barcelona
Diversification	Non-port sectors	Similar instruments	London Liverpool Boston

The first strategy is maritime cluster. A cluster is defined as a network platform in which different economic actors coordinate with each other and enjoy the mutual benefit of network governance (Doloreux & Shearmur, 2009); these economic actors include producers, consumers, suppliers, a labor market, training centers, agencies and the government (Porter, 2003). Port activities require a wide range of service industries and a specialized labor market, thus attending to a maritime cluster means lower transport costs, high quality labor and a positive externality of knowledge spillovers (Brett & Roe 2010).

The second strategy is port-industrial development. Ports and port-related industries are often strongly linked with each other. Since the 1950s, the Maritime Industrial Development Areas (MIDAs) has been established all over the world, especially in America, Europe and Japan. After the 1970s, a port area is used more as a place for warehouses, business centers and light industries due to the pressure of environmental and population growth. In order to strengthen the relationship between port-industrial development and urban functions, two new modes—

industrial-ecology and renewable energy—were introduced in the industrial cluster. (OECD, 2013)

The third one is the redevelopment of waterfronts, which means removing port activities from the original port area and changing the land use pattern into a more mixed way (Millspaugh, 2001). However, land use patterns are affected by developing objectives. If analyzing the structure of land use pattern in different port cities, distinct results can be seen. For example, in Port Vell, Barcelona, public space occupies 80% of the waterfront area. In the redevelopment of waterfronts, government should pay attention to three specific aspects: old port functions, tourism and entertainment, as well as food industries which attracts customers from adjacent places (OECD, 2013).

The fourth strategy is urban diversification. Municipalities of port cities realize that overdependence on port activities will raise the vulnerability of urban competitiveness, so urban diversification must be considered as one of the major principles in development. For example, Ningbo, China is a port city dependent on port trade in the 1990s, and the municipality of Ningbo realized that the risk came from fierce competition with other ports. Therefore, more financial support was given to ecological agriculture, tourism and innovation industries; some port also induced industries such as chemical industries (Huang & Bao, 2011). Diversification does not mean abandoning port characteristics; rather, specialization and diversification both contribute to the development of a port city.

The final one is collaboration between port cities. The aims for collaboration are not only for coordinated development but also for facing common issues of port city development. This kind of cooperation began earlier in the European Union, as seen in Ducruet's (2006) research about two port city allies along the coastal area of the English Channel. In his study, he found that the major factors for a successful port city ally are coherent interests, a well-organized coordinating institution and an advanced logistic system.

From the analysis above, it is easy to see that there are no specific models to define the port-city relationship because of complex urban and regional contexts. The development of a port is always affected by international market conditions while urban development is more related to local factors (César DUCRUET, Sung-Woo LEE, 2006). The different determinants will cause the diversification of a port-city relationship, as well as the discrepancy between developments of port and port city.

2.3 Impact of the Port in a Port City

The impact of the port in a port city can be divided into positive and negative impacts. In general, positive impacts are all economic benefits to urban development; there is no doubt that a port with eminent natural conditions and advanced infrastructures will be a major driving force of urban development. On the other hand, negative impacts often cause social and environmental issues. Two outcomes that cannot be neglected are the economic spillovers to a broader region and the localization of negative impact in urban areas. This discrepancy leads to a weaker port-city relationship. Therefore, the strategy of a port city

development should not only focus on internalizing economic benefits; it should also pay attention to mitigating the harmful impact of port activities on port cities (OECD, 2013).

2.3.1 Positive Impacts of the Port in a Port City

As an important infrastructure, a port is a logistic node for international trade, and one of the significant influencing factors is the reduction of the transport cost. The Correlative Study (Korinek, 2008) shows that maritime transport costs occupy a large proportion in the gross value of import commodities, and firms located near the port will enjoy a lower transport cost. In other words, the existence of a port holds much bearing to a city focusing on export-oriented industries. Compared with inland countries, the transport cost of a coastal area is lower. Radelet and Sachs (1998) provide a research on ninety-seven countries, and they conclude that the transport costs of inland countries will be twice as much as those of coastal countries. In addition to the locational factor, the transport cost is also affected by the connectivity between inland countries and available ports. For instance, in comparison with other inland countries, the Czech Republic, Switzerland and Austria are surrounded by major ports in the European port system, and this advantage affords these countries more negotiation power to decrease transport costs (Merk and Hesse, 2012). Moreover, the efficiency of a port will also affect the transportation cost, and there is a significant negative correlation between them (Sanchez et al. 2003; Nordas and Piermartini, 2004). However, this effect is related to industries and the development stage of certain countries (Marinez-Zarzoso et al. 2008), which shows that industrial sectors in port cities should be carefully selected in order to gain more benefits from port activities.

Table 2 Link between Port Efficiency and Trade/Freight Costs (OECD, 2013)

Port efficiency measure	Impact on trade	Characteristics	Source
Double port efficiency	32% increase of trade volume	Top 100 non-US and top 50 US ports; 1991-2003	Blonigen & Wilson 2008
From 75th to 25th percentile	25% increase of trade volume	59 countries, 1996-2000	Clark et al. 2004
From lowest score to highest	Decrease of freight cost by 25.9%		Wilmsmeier et al. 2006
One point rise on WEF-index	4.3% reduction in ad valorem transport costs		Abe and Wilson 2009
All ports as most efficient port	82.5% increase in export volumes	14 Brazilian ports	Haddad et al. 2010

Another benefit of port on urban area is the creation of an additional added-value. For example, Rotterdam generated $12.8 billion of added-value in 2007, which account for 10% of its regional GDP. This value comes from four tracks: the increase of employment opportunities and income by the construction and operation of port infrastructures; the increase of employment opportunities and income by port-related industries; a stimulated domestic demand by the increase of income; and foreign investment that is attracted by port prosperity (Ferrari et al. 2011). An important conclusion of the research by OECD is that as the scale of a port becomes larger, the added value also increases. If the port-related industries are analyzed using the Leontief Multiplier, it is clear to see a strong backward linkage between port activities and port related industries.

Table 3 Overview of Port Multipliers (Backward Linkages) (Source: OECD, 2013)

	Leontieff multiplier
Le Havre/Rouen	2.47
Marseille	2.01
Mersin	1.79
Hamburg	1.71
Antwerp	1.18
Rotterdam	1.13

Moreover, the value-added effect appears in three kinds of industries: a port-required industry, which is directly related to port activities; a port-attached industry, which refers to export firms and processing refiners; and a port-induced industry. In this last category, a variety of firms want to expand their market share by the means of convenient transportation infrastructures. The effect of a port on non-port-related industries is hard to be measured (Yochum and Agarwall, 1987, 1988). However, they are able to provide additional added-value to port cities.

In addition, there are still some benefits which cannot be ignored. The first benefit is the promotion of employment; an empirical study of the European port region shows that 100 million units of cargo throughput will create 0.0003% of regional employment opportunities (Ferrari et al. 2012). Secondly, a port city is becoming an innovation center for port-related industries. A port will also promote tourism by providing waterfronts and other tourism activities. (OECD, 2013)

The spillovers of economic benefits—especially the indirect and catalytic effects—will spread to other cities, such as the central city in a metropolitan area. In the case study of Rotterdam, the positive externality of the Rotterdam port has even spread to adjacent countries like Germany and Belgian (OECD, 2013).

2.3.2 Negative Impacts of the Port in a Port City

The negative impact of the port in a port city contains three aspects: environmental pollution, incompatibility of land use patterns, and traffic congestion caused by port-related transportation flow and other social impacts. (OECD, 2013)

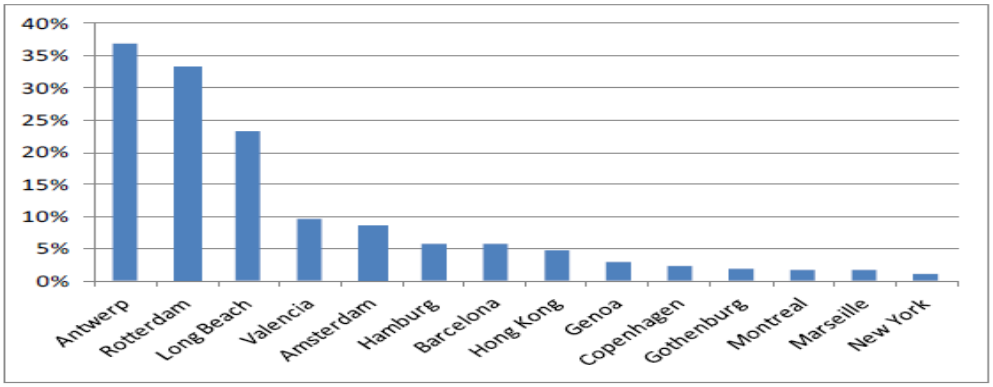
The most urgent problem is the problem of the environment due to its direct relationship with the health conditions of citizens. The research of OECD shows that air pollution as a result of port-related industries is the main source of air pollution in urban area (Castells Sanabra, 2013). If the research scope is limited to a port city, it is easy to find that a large part of air pollution comes from emissions by shipping-related industries, especially in Hong Kong, Shanghai, Los Angeles and Rotterdam. The emission of pollutants will generate huge external costs. A research led by Castells Sanabra et al. (2013) found that the negative impact on the environment costs $206 million Euro. Besides air pollution, port activities also have an impact on water sources, soil, and biodiversity.

Table 4 Shipping-Related Emissions as Share of Total City Emissions (Source: OECD, 2013)

Port	SO_2	NO_x	PM_{10}
Hong Kong	54%	33%	
Shanghai	7%	10%	
Los Angeles/Long Beach	45%	9%	
Rotterdam		13-25%	10-15%

The conflicts of land use patterns between the port and the urban area can also hardly neglect. The case studies of Long Beach and Antwerp show that their ports always required a large area in the coastal region of the port city. In Rotterdam and Antwerp, the proportions are even higher than 30% of the urban area (OECD, 2013). There is no doubt that due to the negative effect on the agglomeration of the population and industry clusters, there is a fierce competition of limited land resources between the port and the port city.

Figure 5 Port Land Surface in Selected Port-Cities Share of Total City Area (Source: OECD, 2013)



Port activities need strong linkages between a port and its hinterland hence transport systems of a port city is often under great pressure. With the trend of containerization, this pressure is becoming even more immense. Berechman (2009) tested the relationship between the throughput of the port and the external cost of traffic congestion in New York; the result was that with a 6% increase of throughput, the extra cost will be 0.3 to 0.8 billion dollars annually. The situation is even worse in emerging port cities. Conversely, the traffic congestion in urban areas will in turn affect the efficiency of the port, and if a port city is not able to improve both its port efficiency and its urban transport system, the inadequate development of one port will affect the development of the other port (Notteboom and Rodriguez 2011).

The negative impact also appears in a few social aspects such as the relocation of residential areas, the change of lifestyles, noise pollution, and aesthetic problems. These negative impacts have influenced the competitiveness of port cities, and they have created the need for the municipalities of port cities to mitigate these impacts by specific policy instruments. (OECD, 2013)

2.4 Urban Competitiveness of Port Cities

The definition of urban competitiveness is measured by the capability of a city to attract investment and to promote its development. The main factor of urban competitiveness is the quality, the efficiency, and the potential of urban development for the future (Baoxing Qiu,

2002). A port is a significant locational factor for the development of a port city, and a port cannot be owned by an inland city. Currently, port-cities relationships are experiencing a separation in spatial and functional aspects, but municipalities of port cities are trying effective policy instruments to internalize the benefits of the port and to improve its urban competitiveness. (OECD, 2013)

2.4.1 General model of competitiveness

Michael Porter (1980) generated the most classical model in the field of competitiveness. It is widely applied to the analysis of a firm strategy in a certain industry. Porter drove his attention to the study of national competiveness. The diamond model that he generated to explain the factors related to national competitiveness is used as well in the context of industrial competitiveness.

Porter (1980) claimed that the substance of the strategy to improve competitiveness of a firm is related to the circumstance of the industrial context. The context consists of the industrial structure and the condition of competition. In this situation, five competitive forces will influence competitiveness of certain entities; these forces are the bargaining power of suppliers, the bargaining power of buyers, the threat of new entrants, substitutes and the level of rivalry. During the competition, there are three general strategies as alternatives: overall cost leadership, differentiation and focus. The first two strategies are directed to the entire market in occupying more market shares, while the third strategy focuses on a specific market to avoid unnecessary competition.

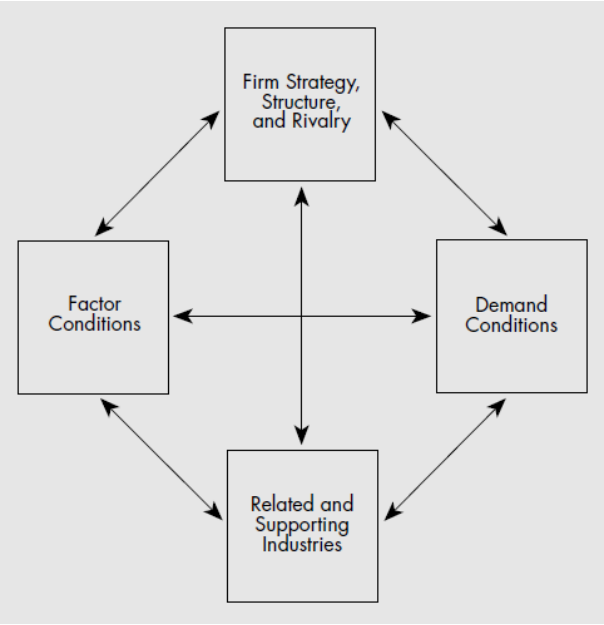
In the field of national competitiveness, Porter (1990) claimed that the sustainable competitiveness of a country promotes the development of industries and creates a better circumstance for international competitiveness. He also mentioned that the main measurement of international competitiveness for a firm is the continuous growth of export and outward investment.

Porter (1990) used the diamond model to explain the competitive advantage of a country which is an interrelated system, and this model consists of four elements. The first one is production factors, which can be classified as human resource, natural resource, capital resource and infrastructure. The possession of a certain resource provides comparative advantage to a nation. However, the lack of production factors can also enforce the government and firms to find another developing strategy in order to reverse the situation. The second one is demand condition; in this aspect, the domestic market is the main source of firm competitiveness and thus it is one of the responsibilities for a government to foster a strong domestic market and promote domestic demands. The third one is forging of an industrial chain of related fields. If one domestic industry that has the ability to compete with foreign players, related industries will be benefited from its international competitiveness. Port activities have such an impact on port-related industries, therefore it is necessary to build a port industry chain to promote the development of port cities. The final element in the model is firms, specifically the institutional structure of firms and the competitive condition. Due to the trend of enterprization in port management (Wen-Chih Huang, et al., 2011), the

competition between ports can be seen as horizontal completion in a specific industry. Therefore, it is necessary for the municipality to provide policy support for the port.

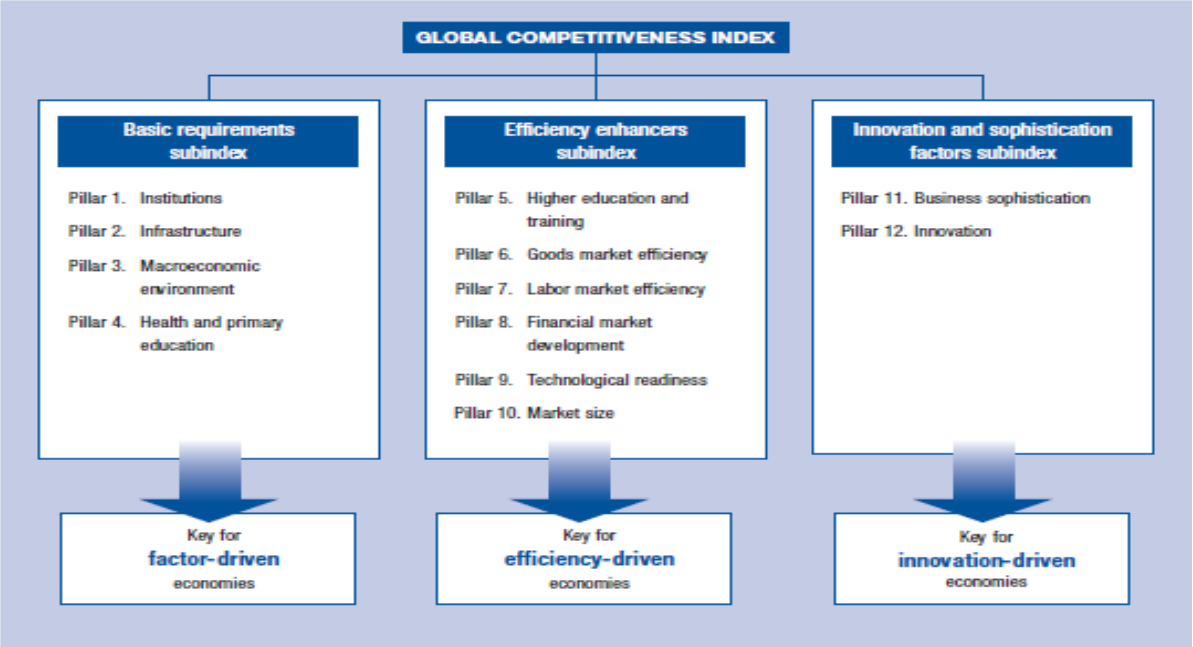
In addition to the four elements, there are two external factors in the complete diamond model. One factor is opportunities, which can be described as uncontrollable changes in the international scale, and this factor will affect other elements of diamond model. The other one is the government, which will use policies to support the industrial development.

Figure 6 Diamond Model of Competitiveness (Source: Porter, 1990)



The research of Global National Competitiveness is done by World Economic Forum (WEF, 2013). Following the steps of Porter (1990), WEF defines national competitiveness as productivities, and WEF also develops a complete indicator system of determinants with 12 pillars. These determinants of competitiveness are classified into three categories: factor-driven, efficiency-driven and innovation-driven. The impacts of the pillars on national competitiveness are different in diverse countries. Therefore, countries are also classified and weighed according to the GDP per capita and other indicators in order to calculate the final result for each member.

Figure 7 Global Competitive Index (Source: WEF, 2013)



The definition of urban competitiveness contains many dimensions. Storper (1997) and Kostiainen (2002) thought the ability of attracting flows of information, technology, capital, culture, people and organization is the key concept of urban competitiveness. This is coincident with the opinion of using FDI as indication of urban competitiveness. Besides, other researchers emphasized the importance of creating an attractive environment to improve living quality (Pengfei Ni, 2011). For instance, BHI (2002) thought creating an attractive environment for new business is the core conception of urban development.

Furthermore, empirical studies have also been done at the local and regional scales. Krsel's (1995) study shows that urban competitiveness is affected by economic and strategic factors. In his research, the three components of gross retail sales, added value of manufacture and commodity make up the indicator system that is used for measuring urban competitiveness. Rondinieli (1998) and Shaleen Singhal (2013) have also established their own theory about urban competitiveness. The main limitation of these studies is the lack of theoretical basis for empirical study. According to Porter (1990), the characteristics of a city are only variables for city competitiveness, and the indicator of urban competitiveness should be the productivity of a certain region.

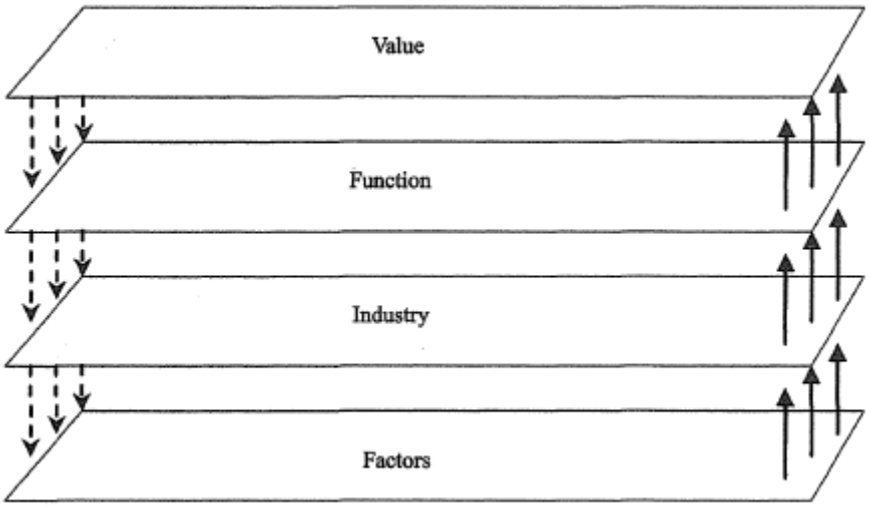
Moreover, the researches of urban competitiveness are going deep into measurement of urban competitiveness. There are three groups of indicator systems: inputs-outcomes factors, outcomes factors and inputs factors. (Pengfei Ni, 2011) indicators used in these models have some similarities like reflecting to economic performance, living standards and environmental attractiveness. However, the framework for empirical analysis is far from established (Kitson, 2005).

In this research, the indicator system of Global Urban Competitiveness Report is used as urban characteristics in regression model. In the conceptual framework of this report, though firms are regarded as value creators, the procedure of value creation is not determined by

firms itself, but also influenced by enterprises quality, resource endowment, factors of production and consumption, infrastructure and public services. These factors determine the specific industrial system and functions of a particular city, as well as value creation status (Pengfei Ni, 2011).

In the indicators system established by Pengfei Ni (2011), three aspects of factors should include to measure urban competitiveness. First, the output of urban competitiveness is ability of a city to create value, and the indicator system consist of GDP (market share), GDP per square kilometer (economic density), GDP per capita (economic efficiency), patent applications per 10000 people (technological Innovation), Economic Growth (Real GDP growth) and number of multiple enterprise (Decision-making Ability)

Figure 8 Theoretical Framework of urban competitiveness (Pengfei Ni, 2011)



Second part is industry competitiveness that represents value creation procedure. Due to lack of data, it is unable to analyze it accurately, so this part is deleted from regression model. The third part is input of urban competitiveness which refer to the factors and environments that constitute urban competitiveness. The firm is value creator of a certain city, so enterprise quality refers to inner quality of economic entities is the core of the bull's-eye model. The other five factors include local supply (refer to factors and environment of a city), local demand (entities' demand on products and services), global connection and inner structure (interactions among entities in one city or between different cities).

2.4.2 Urban Network and FDI

In the study of urban network, there are basically two schools. The first one is leading world city network studies conducted by Alderson and Beckfield (2004), and the second one is Global and World City (GaWC) Research Network leaded by P. J. Taylor. These two mainstreams have fierce conflicts between each other, former one use the network data of multinational corporations in all industries because according to the theory created by Hymer (1972), the relationship between cities are linked by multinational corporation. While the latter one focused on advanced producer service (APS) because this industry could generate an interlocking system in their own rights. Compared with Multinational Corporation, the GaWC research is doubt by Alderson and Beckfield (2006) because other sectors are also

possible to create connections between cities. To conclude, the data in all industry is more complete than the one for only APS Corporation to illustrate the structure of urban network.

The futher study of urban network turned to FDI data because Multinational Corporation is the hub and investor of FDI. Rugman's study (2005) shows Top 500 Multinational Corporations control more than 50% of global foreign investments. FDI could be regarded as the expansion of multinational corporation network because FDI is the long-range investment conducted by Multinational enterprises to the countries other than the home country where headquarters located. (Ronald et al, 2011) In recent study of urban competitiveness, Capacity of attracting inward foreign investment is not only an instrument, but also an indication of success of competition between cities （lovering, 2003）.

Therefore, according to the review of urban competitiveness and definition of FDI, the capacity of attracting foreign investment could be the indicator of urban competitiveness. Therefore, this research will use inward FDI value as the dependent variable and indicator of urban competitiveness. And the determinants that affect the capability of attracting foreign investment are analyzed by former researches. Dunning (1993) set up an OLI (Ownership, Locational Advantage and internationalizing) paradigm to illustrate the situations in which multinational corporation decided to invest abroad. The first situation is when the company has the power gained from ownership of products to control a certain market. Also, locational advantage will attract multinational companies to locate their plants in foreign countries rather than home countries. Finally, internationalizing activities to foreign countries will instead cooperate with other forms to get more profit and reduce cost.

Furthermore, there are four motivations of Multinational Corporation to invest in foreign countries. Dunning (1993, 1998) illustrates them as natural resource-seeking motive that is targeted at gain natural resource at lower price than home country, market-seeking motive that refers to expand the range of market, efficiency-seeking motive that related to reduce production cost, and strategic-asset-seeking motive motivated by acquisition of special asset such as technological capabilities, management and marketing expertise. In order to satisfy these motivations of multinational corporations, the destination of foreign investment should possess as many as pull factors related to locational advantages. (Ronald Wall, et al, 2011) In spite of conceptual analysis, empirical analysis was also done by a lot of researchers. For instance, Brakman and Van Marrewijk (2008) found that market-seeking motive is the most important reason for multinational corporations to invest abroad. In addition to these four motivations, Daude and Stein (2007) put the institutional environment in consideration as one of main factors of attracting foreign investment.

When analyzing the factors of FDI, Inward investment and outward investment should separate from each other because of different requirements of multinational corporations. This research focuses on the capacity to attract foreign investment, which means only determinants that impact the choice of destination to invest. Based on former research, determinants of FDI's host territory consist of four motivations and institutional environment. (Ronald et al, 2011) Specifically, GDP represent the market size of certain territory that is related to marketing-seeking motivations. GDP per workers was used as substitute variable of average income for workers, which is obviously related to efficiency-seeking motivation. In

other aspects, natural resource-seeking motivation used share of fuels export in total export (Bond and Malik, 2009), the variable of strategic asset-seeking motivation was high-technology exports. And institutional environment is based on six dimensions of Kaufmann's research (Kaufmann et al, 2004). The result of analysis shows the motivation of foreign investment is the mixture of market-seeking, efficiency-seeking and strategic-asset-seeking. These determinants form the structure of global urban network connected by FDI data. (Ronald Wall et al, 2011)

Based on the literature review of definition and determinants of FDI, it is clear that the capacity to attract foreign investment could be the indication of urban competitiveness (Lovering, 2003). And the determinants of this capacity are in 5 categories, which are market size, natural resource, strategic assets, institutional environment and efficiency factors about labor, material and capital that will reduce cost of products and service (Dunning, 1993, 1998). In contemporary literature, market-seeking motivation, efficiency-seeking motivation and strategic-asset-seeking motivation made up of the requirement for host city of foreign investment (Brakman and Van Marrewijk, 2008). These aspects will be included in regression model of this research to be independent variables.

2.4.3 Port Competitiveness and Port City Network

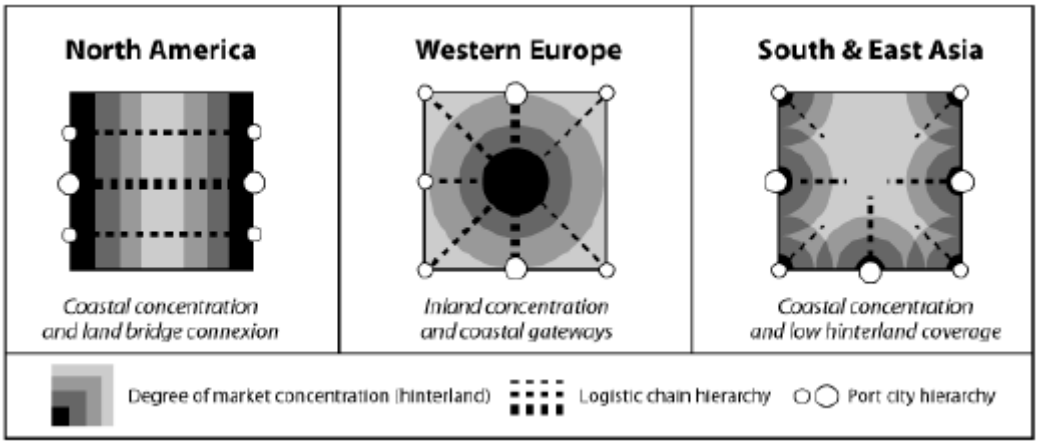
Linked with literature review of impact of port city competitiveness, one of main positive impact of port activities is reducing transportation cost, which satisfies efficiency-seeking motivation of attracting foreign investment. Therefore, the variables linked with port characteristics could be added in the regression model of determinants of urban competitiveness of port city. Based on the research of OECD, there are three aspects of port competitiveness. The first one is maritime connectivity. Three kinds of centralities are used in this aspect to measure the level of accessibility of a certain port. The second dimension is port efficiency, throughput of container and bulk goods, as well as ship calling and other indicators of port activeness. The third dimension is hinterland connectivity. The condition of transportation system was used in this part. In the study of evaluating competitiveness of container ports in Korea and China (Gi-Tae Yeo, et al, 2008), the port service are divided into port service, hinterland condition, availability, convenience, logistics cost, regional center and connectivity.

In this research, World Port Index (WPI, 2014) was used as the source of port characteristics that provides location, characteristics, facilities and available services of ports all over the world. The main variables of port characteristics used in this research are harbor size (a general indicator based on area, facility and wharf space), sheltered afforded (shelter afforded from wind, sea and swell), depth of channel (deepest channel), anchorage (least depth of anchorage), cargo pier (greatest depth of cargo pier) and oil terminal (greatest depth of oil terminal), and maximum size vessel (whether a ship over 500 feet long may be accommodated). Facilities of port is represented by repairs (level of repairs that can be made to vessels), dry-dock and marine railway (size and type of the largest underwater repair facility), communications (types of communications are available to nearby area such as Air and rail) and Service (navigation equipment and electric repair) are the main indicator of

service to show whether these service are available in certain port (National geospatial intelligence agency, 2014).

From the Theoretical studies of relationship between port and port city, it is convinced that the interdependence between port and port city is undermining, this trend were tested and confirmed by empirical studies. According to Ducruet's (2006) research of 121 port cities based on container throughput and urban population, interdependence between port prosperity and urban development are declining in general. In addition, further factor analysis highlighted regional differentiation of port-city relationship. Europe shows core-periphery dualism, where port cities are only transfer hub for its hinterland, on the other hand, Asia shows coastal development pattern in which port cities both markets and transportation center of this region.

Figure 9 Structure of port city network in different regions (Source: Ducruet, 2006)



Port-City relationship is expressed by the trend of demographic size and container's throughput. European port city have a lower but stable interdependence. While port cities in Asia had a strong but declining interdependence, one of important findings is that port activities in Asia concentrate in the largest cities (Hoyle, 2000). The limitation of this research is lack of data closely related to urban development to test the relationship between port activities and urban competitiveness. In the future study, urban characteristics in different dimensions should be taken into consideration (Ducruet Cesar, 2006)

Another pattern of research starts from urban network analysis. Based on the result of GaWC project, urban network is established by geographical distribution of APS firms, Jacobs. W. (2010) compare the APS network and port throughput to analyze the positon of port city in global urban network. The result shows weak relationship between ports and cities, this research shows the potential to compare port network and urban network. However, lack of data and limitation of methodology influence this research negatively, in order to improve them, indicators about container traffic and local factors should be included in analysis, and social network analysis methods is an important direction of futher study. (Jacobs, Ducruet and De Langen, 2010)

To conclude, the data selection and methodology of network analysis needs to be improved in studying port cities. Based on literature review of FDI and global urban network, FDI data has the potential to be both the indicator of urban competitiveness and the network data to

analyze the structure of global urban network. Also, port network could be represented by container route data. In terms of method, social network analysis is suitable to test relationship between port network and urban network.

2.5 Conceptual Framework

2.5.1 Summary of Literature Review

Port-city relationship experienced a period of segregation in recent decades because of economic spillover to other regions and negative impact on environment and social aspects. However, it could not be ignored that port could provide added value, reduce transportation cost and promote the innovation capacity to port-related industry to urban area. To internalize the benefit and mitigate harmful impacts, municipality of port city adopted two main strategies to improve urban competitiveness of port city. The first one is diversification strategy that utilizes port as important asset to attract other economic sectors, while the second one is collaborating strategy to develop maritime industry and build a transport hub.

The problem in front of port city is how to choose the developing path. According to the literature review, answer of this question depend on whether port activities have positive impact on improving urban competitiveness and what are determinants of urban competitiveness of port city, and network analysis and regression analysis need to be done In order to get the answers.

For network analysis, FDI data with origin and destination is a good variable to build global urban network according to former analysis as the expansion of MNCs' network (Alderson and Beckfield, 2004, Ronald, 2012). In terms of port network, container route data gathered from professional website Linescape will be used to establish the port network. Port network and urban network will be compared with each other by social network analysis method to test whether they have positive relationship with each other that means port activities could improve urban competitiveness to some extent. The detail of methodology and data collection will be in Chapter 3.

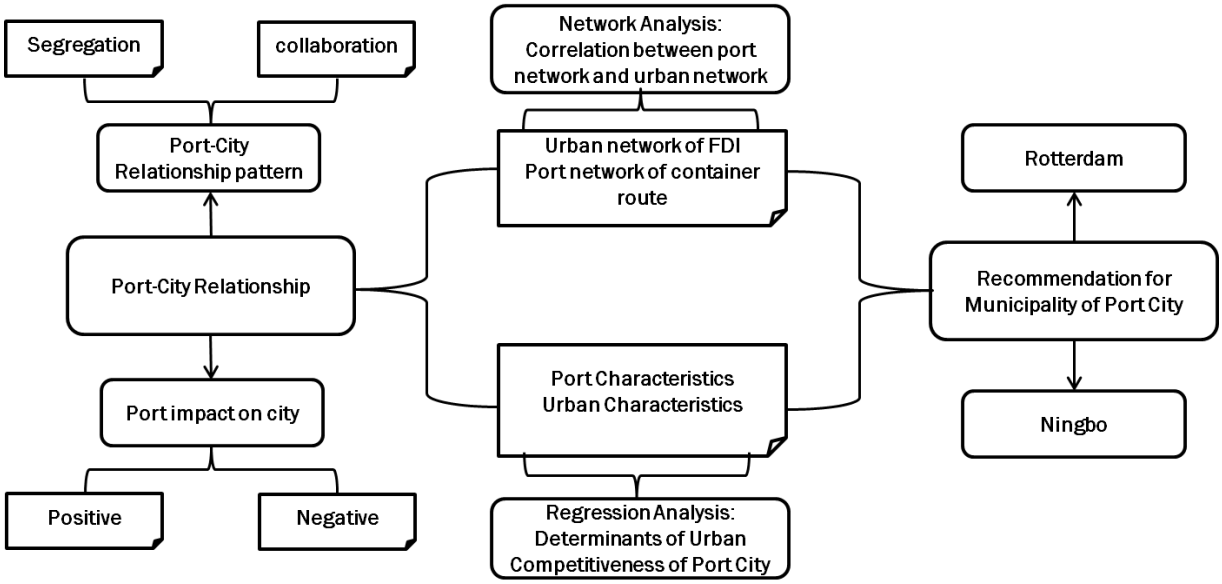
The theory of FDI showed that the capacity of attracting foreign direct investment could be indication of urban and regional competitiveness (lovering, 2003). Therefore, FDI would be dependent variable of regression analysis to measure urban competitiveness. In terms of independent variables, the determinants of MNCs' investment choice and factors of urban competitiveness are closely related with each other. MNC's motivation in current period could be defined as the mixture of market-seeking motivation that could be explained by output factors of urban competitiveness like GDP (Ronald, 2012), efficiency motivation that is closely related to factors of reducing production cost, in which port characteristics could be included because port is a locational advantage to reduce transportation cost, and strategic-asset-seeking that could be represented by number of international patents and MNCs. In addition, institutional environments is also important for attracting foreign investment, the input factors in Global Urban Competitiveness Report (GUCR) represents the business environment of cities which could be the indicators for institutional environment.

The result of network analysis and regression analysis would provide information to municipality of port city in policy making procedure based on the strategies summarized by OECD (2013).

2.5.2 Conceptual Framework

Based on literature review, the conceptual framework are as follow:

Figure 10 Conceptual Frameworks (Source: Author, 2014)



The left side expressed the problem that is addressed in this research. Port activities have both positive and negative impacts on a metropolitan area. As a result, there are two types of relationship patterns that have emerged. The first one is segregation, which means a port area is separated from an urban area in both spatial and functional aspects. The second one is combination of port functions and urban functions, which means port cities use ports as important asset to build comparable advantage and reap the economic benefits of port activities. The problem in front of municipality of port city is how to internalize benefit of port and mitigate negative impact to improve urban competitiveness.

In order to provide policy recommendations to municipality of port cities, network analysis and regression analysis were done to answer two main questions. First one is about port-city relationship, which is whether port activities improve urban competitiveness. This will give support to choose the path of urban development, diversification or combination? Second one is which aspects related to attract investment should be improved by municipality of port city.

In the middle of conceptual framework is the analysis stage that is divided into two steps. The first step will be focus on network analysis, and the purposes for this step are to explore the importance of a port city in the global city network and to test the relationship between port activities and urban competitiveness. The second step is regression analysis, the purpose of this step is to seek for determinants of urban competitiveness of port cities and compare the capacity to attract FDI between port city and non-port city. In this step, port and urban

characteristics will be the main factors in the analysis, and the result will be the guide for municipality of port city.

Through the result of the analysis, this research will then zoom in on specific port cities. Rotterdam and Ningbo are selected as representatives of port cities because they are both important transportation center in their city region, but not central cities in terms of ability to attract FDI, (the reason of choosing these two cities were explained in chapter 3).

3. RESEARCH DESIGN AND METHODS

3.1 Revised Research Question

The main research question was:

How can the advantages of ports be internalized to improve urban competitiveness of port cities?

A. For global port cities, whether port network measured by container route has significant relationship with urban network measured by FDI?

B. Among port and urban characteristics, which are the determinants that strengthen the urban competitiveness of port cities?

C. Based on the former analysis, what kind of competitive and complementary recommendations could be provided for the development of port cities?

3.2 Operationalization

Table 5 Operationalization (Source: Author, 2014)

Concept	Variables	Indicators	Source
Urban Competitiveness	Capacity Of Attracting Investment	Foreign Direct Investment	**Financial Time Limited 2014,fDi Market**
City Characteristics	Output factors	GDP per Capita	**Global Urban Competitiveness Report (2011)**
		GDP	
		GDP per Square Kilometre	
		Real GDP Growth	
		No. of International Patents	
		Multinational enterprises	
	Input Factors	Enterprise Quality	
		Local Supply	
		Local Demand	
		Inner Structure	
		Public Institution	
		Global Connection	

Port Characteristics	Natural Factors	Depth of Channel	**World Port Index (WPI), Fleetmon, Linescape**
		Depth of Anchorage	
		Depth of Cargo Pier	
		Depth of Oil Terminal	
		Tide	
		Harbour Type	
		Port Size	
	Port Efficiency	Port activities Index	
		Ship calling	
		TEU 2012	
		Maximum Size Vessel	
	Infrastructure and Service	Railway level	
		Dry-dock	
		Shelter Afforded	
		Rail	
		Navigation Equipment	
		electric repair	
	Maritime connectivity	Number of container route	
		Transhipment Condition	

According to literature review, urban competitiveness could be defined as the capacity to attract foreign investment. Therefore, it was measured by the FDI number and value collected from Financial Time Limited 2014 on fDi market website. The FDI number and value would be used in both network analysis and regression analysis. Specifically, FDI number data was the total frequency of foreign investment from origin to destination from 2003 to 2012, and FDI value data represented the total value of foreign direct investment from original city to destination city from 2003 to 2012. It is also important to point that in order to measure ability of attracting FDI, only inward FDI of a certain city are used for analysis that means the city is destination of FDI.

The port network data was container traffic data gathered from Linescape, a professional website to search for available container route from certain origin to certain destination. The data consisted of two main values, first one was transshipment condition, which means whether container route between two nodes is direct or not, the value is 2 if there is direct route between two ports, the value is 1 if there is contain route between two ports which is not direct, and the value is zero if there is no container route between two ports. The port network data was collected as follow format:

Table 6 Attribute data of network (Source: Author, 2014)

Origin Port	Destination Port	Transshipment Condition	Number of Container Route
London	Shanghai	1	378
Singapore	Shanghai	2	22146
Hong Kong	Shanghai	2	23258
New York	Shanghai	2	1639
Tokyo	Shanghai	2	3445

The network analysis focused on relationship between port network and urban network. Both port network data and urban network data would be used in the Quadratic Assignment Problem (QAP) models with the purpose of testing the relationship between the prosperity of ports and the development of port cities. Network data included direction (each record has a source city/port and a destination city/port) and geographic coordinates could be easily changed into the 1-mode matrix suitable for network analysis. The method of network analysis will be explained in the section of research strategy and methodology.

In the regression analysis, with the exception of inward FDI as dependent variables, characteristics of port prosperity and urban competitiveness were included in the regression model as independent variables. Based on literature review of FDI and urban competitiveness, FDI could be indication of urban competitiveness and determinants of FDI could match with the determinants of urban competitiveness.

According to Global Urban Competitiveness Report (2011), output of urban competitiveness and input factors—were main factors of urban competitiveness, they could be matched with motivation of Multinational Corporation to choose destination of foreign investment. Specifically, market-seeking motivation could be replaced by GDP and GDP growth rate, efficiency-seeking motivation could be represented by GDP per capita (which is similar to average wage), as well as factors of port competitiveness because port could reduce transportation cost (Ronald, 2011), and strategic-asset motivation could be substituted by number of international patent and multinational enterprise. Moreover, institutional environment could be replaced by the performance of business environment such as inner structure, enterprise quality, public institution and global connectivity.

Port characteristics were added as the factors of efficiency motivation that affects urban competitiveness of port cities. According to the analysis of OECD (2013), port competitiveness consists of maritime connectivity, port efficiency and hinterland connectivity. Attributed data related to hinterland connectivities are gathered from WPI, namely natural factors, available service and infrastructure (which is illustrated in detail in Chapter 2). And the data of port efficiency and maritime connectivity are gathered from Fleetmon, Linescape and International container yearbook (2012). Separately, Fleetmon and International Container Yearbook (2013) provide indicators of port efficiency. International Container

Yearbook provides TEU and TEU Growth rate of selected 50 cities (the method of selecting cities will be explained in 3.6). Fleetmon provides the port active index (show the level of activeness of a certain port based on number and size of ship calling at a certain port) and ship calling in real time (search for 50 port cities in the same day to show the activeness). Linescape provides the indicators of maritime connectivity, which are port network data about container route (which has been illustrated before). However, the attributed data are not used as independent variables in regression analysis directly, In order to measure the level of maritime connectivity, degree centrality, betweenness centrality, and eigenvector centrality (which will be introduced in 3.3) are calculated from these network data

3.3 Research strategy and methodology

This research consists of three parts, and they were defined as the descriptive section, the exploratory section and the prescriptive section; each section had a distinct strategy and methodology. Modeling was the research strategy of this research because secondary data is available for network analysis, and different kinds of models will be used in all three parts. In the first part, network analysis needed secondary data to do a QAP correlation test. In the second part, port and urban characteristics were necessary for collecting data for linear regression models for the purpose of seeking determinants of port city competitiveness. In the final part, though the main objective was providing policy recommendation to municipalities of Rotterdam and Ningbo, the results from the former stages were an important basis of suggestion.

3.4 Data Collection Method

The first step of data collection was selection of cities. Two yearbooks were used as the source to select the cities: one is the International container yearbook (2013) and the other is the Global Urban Competitiveness Report (GUCR, 2011). From the international Container Yearbook, Top 50 ports were chosen based on the ranking of Twenty-foot Equivalent Unit (TEU) of 2012 and whether the port city could be found in top 500 cities in GUCR 2011. On the other hand, the 50 general cities were chosen according to FDI data collected from FDi Market, the principle of choosing these cities is that they have similar number of inward FDI with selected port cities so that they will be comparable. Also, the selected general city should be in the list of Top 500 cities of GUCR 2011. (The city list will be in ANNEX)

In the first stage, the FDI number and value with coordinates and port network data would be collected for network analysis. The source of the FDI data is Financial Time Limited 2014. Port network data contains the number of container route and the transshipment condition; these data are collected from the website of Linescape, which is an authoritative platform for searching available container routes. In addition, the geographic coordinates of ports come from the WPI data base, which is a comprehensive database for ports all over the world.

In the second stage, in spite of the network data collected from the first stage, information on port characteristics and urban competitiveness were gathered from a different but reliable database. The TEU and TEU growth rate of selected port would be gathered from International Container network (2013). And the port activity index and ship calling in real

time were collected from Fleetmon. Port characteristics are collected from WPI database, and indicators of urban competitiveness came from the Global Urban Competitiveness Report (2011).

In the third stage, the results from the former stages would be used. In addition, more secondary data in text about two selected port cities—Rotterdam and Ningbo—would be gathered from literature, websites of municipalities, and development plans for ports and cities.

3.5 Validity and reliability

Reliability was the basis of validity. In this research, reliability came from authoritative databases. For example, the FDI data were collected from fDi Market, the urban competitiveness data come from Global Urban Competitiveness Report (2011), and port characteristics were gained from WPI database. Moreover, the data collected are suitable for the objective of this research. Firstly, 50 port cities and 50 non-port cities are selected by the ranking of FDI numbers to ensure that they are all competitive cities. Then, in the regression analysis section, both port and urban characteristics are included in the models, and the result will focus on port characteristics that affect urban competitiveness. However, urban competitiveness indicators are also important as controlled dependence in order to ensure the quality of the regression models.

3.6 Data analysis and techniques

3.6.1 Descriptive research: Network Analysis

In the first stage, descriptive research will be done to illustrate the position of the selected 50 port cities in the global urban network and to test the relationship between the prosperity of ports and the development of port cities. In order to achieve this objective, UCINET will be used for this stage.

The structure of the port cities network was expressed by both FDI data and port network data using the number of container routes and the transshipment condition (direct or not). These data will be transformed from the attributed data to the 1-mode matrix data. Take the urban network for instance, there were 50 port cities and 50 non-port cities in this network, they are both source and destination nodes in 1-mode network. In this square matrix (See figure 3.1), the source and destination are located in rows and columns with the same order. The function of Pivot table in Excel is used for transforming attribute data into network data.

Figure 11 Matrix of urban FDI network (Source: Author, 2014)

	Shanghai	London	Singap...	Dubai	Beijin	Hong K...	Nyc (Ny)	Paris	Moscow
Shanghai	0	2	14	1	0	16	0	2	0
London	142	0	217	178	99	185	209	125	73
Singapore	56	10	0	21	30	34	6	3	5
Dubai	13	30	20	0	5	9	5	4	7
Beijin	0	27	18	10	0	59	16	10	8
Hong Kong	86	20	30	23	64	1	18	8	1
Nyc (Ny)	117	259	119	109	90	126	2	78	44
Paris	128	149	72	88	72	72	76	0	52
Moscow	4	21	11	15	19	12	11	7	0

Basic instrument of network analysis is centrality which shows the position of nodes in a certain network. There are three types of centralities for a node i. Degree centrality shows the number of nodes directly connected with i in the network, direction could be taken into consideration of degree centrality as indegree centrality (to express direct inward flow) and outdegree centrality (to express direct outward degree).

Second one is Betweenness centrality, the definition of betweenness centrality is linked with the definition of structure hole. If there is no direct link between two nodes, there is a structure hole there. The betweenness centrality is to show the ability of a node to fill up this hole. The formula below could illustrate the definition better. Simply, betweenness centrality is betweenness proportion of a node between a pair (two nodes in a network)

$$Bjk\,(i) = gjk\,(i) / gjk$$

- *The term bjk is the betweenness centrality between j and k.*
- *The term gjk is the number of the paths between j and k.*
- *The term gjk (i) is the number of routes between j and k that must go through i.*

The third one is eigenvector centrality. The power of a node in certain network is determined by other nodes, if a node has direct linkage with many powerful nodes in a network, the eigenvector centrality will be quite high. Strictly speaking, eigenvector centrality is a linear function of other nodes. The calculation process could be defined as follow. The eigenvector centrality of each node is determined by the eigenvector centrality of other. In the following formula, Xi represents the eigenvector of node i， there are n nodes in this network that means there are also X1, X2, to Xn, these X make up of an eigenvector that could be calculated by matrix operation.

$$x_i = a_{1i}x_1 + a_{2i}x_2 + \cdots + a_{ni}x_n$$

$$A_t \cdot x = x$$

- *The term of Xi is the eigenvector centrality of i.*
- *The term of X is the eigenvector including X1 to Xn.*
- *The term of At is the transposed matrix of original 1-mode matrix.*

In addition, this step used the port and port city network data to do further descriptive analysis. With the FDI data of port city and non-port city, it is possible to test whether a port city has an advantage in attracting foreign investment when comparing the city with non-port cities. Through the FDI and the port network data, the QAP correlation test will be used to

test whether there is a relationship between the activeness of a port and urban competitiveness.

QAP correlation test was also important in network analysis. In this research, QAP correlation was used to test the relationship between two 1-mode matrixes with same nodes, in other words, it is a test of correlation between two 'linkages' that could not be conducted by Ordinary Least Squares (OLS) because of collinearity. Simply, this method will test the values in the same vertex of two networks and provide the correlation of two networks.

3.6.2 Exploratory research: Determinants of port city competitiveness

The second step was an exploratory analysis to find the determinants of urban competitiveness of a port city. Two multiple regressions are to be made for conducting the analysis. The first one is the regression model which contains both port city and general cities. This research will test whether port city have advantage to attract FDI when comparing with general cities. Afterwards, further research would be conducted on the port city to find determinants of urban competitiveness.

According to the definition of urban competitiveness and its linkage with FDI, Inward valued FDI would be dependent variables (valued FDI is chosen to avoid using Negative Binomial Regression Model). Then, independent variables are found based on three motivation of MNCs' foreign investment (market-seeking, efficiency-seeking and strategic asset-seeking) as well as institutional environment. The selected variables had been illustrated in detail in 3.2.

In regression analysis, the linear regression model was used for both two steps. The first step focused on comparison between port city and general city on urban competitiveness. So 100 cities were all included in the model. The urban characteristics and dummy variable about city types are taken as independent variables. If the value of dummy variable is 1, this city is regarded as port city, if the value is 0, it is a general city. The second model is to find determinants of port city to attract foreign investment. So both urban and port characteristics are added in the model with only 50 port cities.

3.6.3 Third stage: policy analysis on local scale

In the third stage, policy recommendations would be given to two typical port cities, Rotterdam and Ningbo. Descriptive analysis provided information of the position of Ningbo and Rotterdam in urban network and port network. By the regression analysis, important determinants of urban competitiveness would be helpful to municipalities in policy making procedure.

There were two reason of selecting Rotterdam and Ningbo. The first principle was that cases selected should be important port cities in their respective regions. Rotterdam is a hub port in the European port system, and the Ningbo port is also a gateway port of the Yangzi Delta Region. In addition to the strengths of the ports, these two cities also play important roles in the regional city system. However, they are not the central cities in their regions; they are overshadowed by the major cities in their regions, which are Amsterdam and Shanghai

respectively. Second, they are in different developing stages. As a mature port that originated from a small village, Rotterdam has a 700-year history of urban development. On contrary, Ningbo has been a port city for a very short period of time: the construction and development of the Ningbo port can be dated back to only 30 years ago. This comparison will provide the possibility to create a policy analysis to the local municipality.

This section was a mixture of a quality analysis based on the urban context and the results of the above quantitative analysis. The approach would be a comparative study of typical cases, their great attempts on improving urban competitiveness will enlighten each other.

4. ANALYSIS RESULTS

For reporting the result of the analyses, this chapter is divided into three sections. The first section is a network analysis which shows the positive relationship between a port network and an urban network including 50 selected port cities. The regression analysis shows that when compare with general city, port city is week in attracting foreign investment. However, port city is able to improve urban competitiveness by improving business environment and port competitiveness. The third section will compare Ningbo and Rotterdam with cities in the same regions. The result shows they are both powerful actor in port network, but quite week in other urban characteristics.

4.1 Network analysis

In this section, the structure of urban network consists of 50 port cities and 50 general cities will be illustrated by centrality and cohesive subgroup analysis. Afterwards, the structure of port network measured by number of container route and transshipment condition is analyzed by the same methods. Finally, QAP correlation test between the urban network (only for 50 port cities) and the port network will be done to show the strong linkage between two networks.

4.1.1 Network analysis of urban FDI network

First part of analysis is degree centrality. Only non-normalized degree centrality is used in the analysis. From the table 4.1 below, the source of FDI is centered on several traditional global cities like London, New York, Paris and Tokyo. The cities with high ranking are mainly from the Western world. One common feature of these cities is that the outward FDI number (Outdegree) is several times more than the inward FDI number (indegree). In terms of geographic distribution, it is easily to know each region has some central cities that conduct most of outward investment, and it is interesting to see there are only four port cities (New York, Tokyo, Singapore and Hong Kong) in this network; and the other cities are either inland cities or cities in which port function is apart from urban functions like Amsterdam and London. Furthermore, this result is coincident with economic structure in different regions. In Asia, port cities are both transport center and main market, the typical examples are Tokyo, Singapore and Hong Kong. While in Europe, port city is in periphery of urban network as specialized transport hub for their customers (inland global cities). London, Paris, Munich and Amsterdam are all economic centers without strong port-related industry.

Table 7 Top 10 source of FDI (Source: Author, 2014)

City	Region	Out Degree	In Degree
London	West Europe	3225	1483
New York	North America	2317	820
Paris	West Europe	1994	632
Tokyo	Asian and Pacific	1796	345
Seoul	Asian and Pacific	675	226
Hong Kong	Asian and Pacific	629	993
Stockholm	West Europe	556	156
Amsterdam	West Europe	549	254
Munich	West Europe	540	220
Singapore	Asian and Pacific	490	1224

However, in terms of the indegree number, the destinations of foreign investment are concentrated in cities located in Asia such as Shanghai, Dubai, Beijing, and Hong Kong, Singapore. This could be explained by the tendency of economic development. As a continent with great potential for investment, Asia attracts a large proportion of FDI in this network because of market-seeking motivation of MNCs' foreign investment. This phenomenon will be tested in regression analysis by variables about market size (GDP).

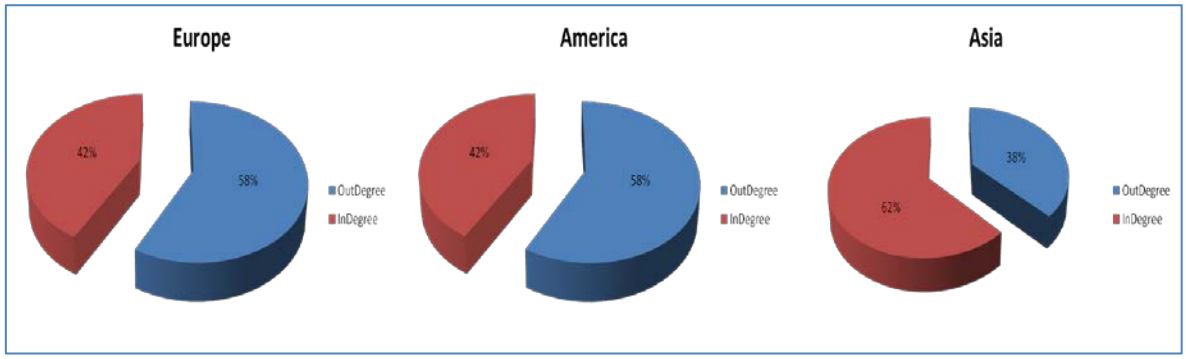
In spite of geographic distribution, there is also an obvious overlap between port cities and top cities as the destination of FDI, Shanghai, Singapore, Dubai, Hong Kong and New York are all largest port city in their regions. This overlap could be illustrated by efficiency-seeking motivation because port is an important force to reduce transportation cost for MNCs. Similarly, the specific determinants about efficiency-seeking motivation that affect urban competitiveness will be tested in regression analysis. However, the analysis of centrality could not prove that port city have advantage to attract foreign investment over general cities, because the port cities in Table 4.2 could not represent the main trend in port city development. Most port cities in the world suffer from the specialization of maritime related industry and show lower attractiveness than general cities in the same region. Also, whether port city have advantage in attracting inward FDI needs to be tested by regression analysis.

Table 8 Top 10 destination of FDI (Source: Author, 2014)

City	Region	OutDegree	InDegree
Shanghai	Asian and Pacific	86	1568
London	West Europe	3225	1483
Singapore	Asian and Pacific	490	1224
Dubai	Middle East	370	1040
Hong Kong	Asian and Pacific	629	993
Beijing	Asian and Pacific	304	936
New York	North America	2317	820
Paris	West Europe	1994	632
Moscow	Rest of Europe	307	610
Sao Paulo	Latin America	112	515

Combination of inward and outward FDI, It is clear that main sources and main destinations of FDI located in different regions. In Figure 4.1, Europe and America are main sources of the network, while main destinations of the network are in Asia. This trend shows the current pattern of the global economic network, according to FDI theory, determinants of outward FDI are mainly ownership advantage that refers to strategic assets of MNC that foreign corporation has no access to them like advanced technology and mature capital market, In GUCR, the result of analysis in global scale also show that American and European cities still have leadership in decision-making ability because the mature capitals markets and agglomeration of MNCs (Pengfei Ni, 2011). However, global cities in Asia own the control power of biggest market in the world, which means having a huge potential in their economies. This trend will attract more MNCs in America and Europe to invest in Asian cities. This trend could be tested in regression analysis by GDP (measurement of market size).

Figure 12 Share of FDI Number in different regions (Source: Author, 2014)



Based on definition of degree centrality, it is not suitable to measure the position of cities in urban network. In order to show the structure of the network, Betweenness centrality will be used to show to what extent a city can control the FDI network (by the ability to fill structure hole between two nodes in the network). The data table below illustrates a similar result with

degree centrality. Each region has several central cities, which are London in Europe, Hong Kong in Asia, New York in North America and Dubai in the Middle East. Based on FDI theory, foreign investment is conducted by MNCs, which is also hub of FDI. Therefore, it was interesting to suppose that a city with more MNCs will gain more power in FDI network because they control the hubs of FDI.

Table 9 Top 5 cities measured by betweenness centrality in FDI network (Source: Author, 2014)

City	*World Region*	*Betweenness*	*nBetweenness*
London	West Europe	631.294	6.507
Hong Kong	Asian and Pacific	418.120	4.310
New York	North America	328.538	3.386
Dubai	Middle East	287.406	2.962
Paris	West Europe	280.442	2.891

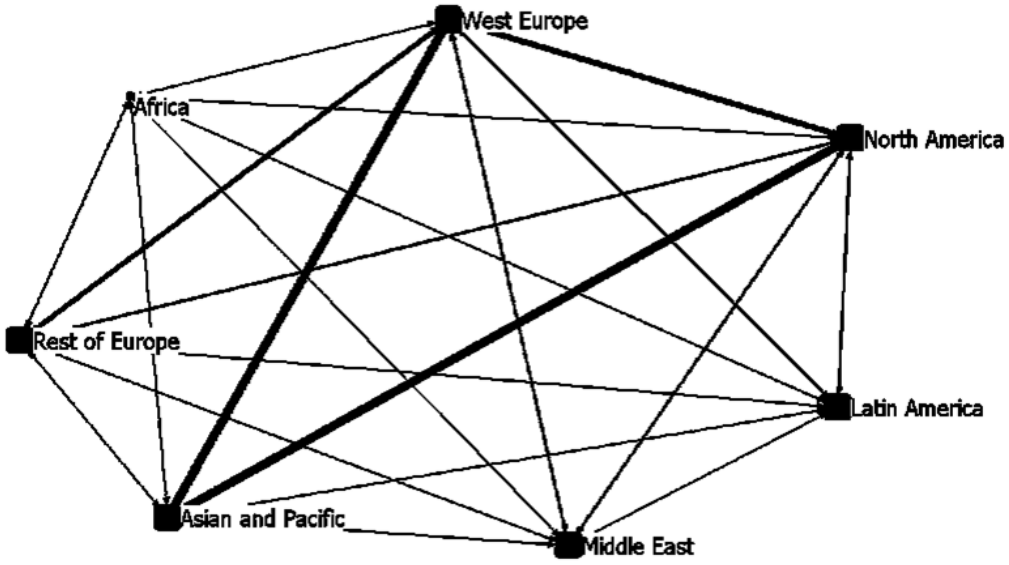
In order to test the relationship between betweenness centrality and number of multinational enterprises of selected 100 cities, the correlation test is done by SPSS, the result in table 4.4 shows there are significant positive relationships between betweenness centrality and the number of multinational enterprises. A city with a larger number of MNCs will be able to gain larger power within FDI network,

Table 10 Correlation test of betweenness centrality and number of MNCs (Source: Author, 2014)

		Betweenness	Multinational Enterprise
Betweenness	Pearson Correlation	1	.750**
	Sig. (2-tailed)		.000
Multinational Enterprise	Pearson Correlation	.750**	1
	Sig. (2-tailed)	.000	

From the former analysis of centrality, the FDI network shows some geographic features in regional scale. Therefore, In spite of analysis in city scale, network analysis should expand to regional scale. Figure 4.2 show the regional network consist of seven regions, there is no doubt that they are directly linked with each other. However, the strength of linkage regions has great difference. The thickness of ties shows the frequency of the FDI number between two nodes (both inward and outward FDI). In this network, there are three main hubs: Western Europe, North America, Asian and Pacific. They have a strong linkage with each another. Coincidently, these three regions are also three hubs of port networks. According to the literature review, these regions are also clusters of main container ports. This conclusion give confidence to QAP correlation test because there is overlap between FDI hubs and port clusters in regional scale.

Figure 13 Network of FDI in regional scale (Source: Author, 2014)



According to analysis of centrality, several conclusions can be drawn. Firstly, in each region, there are several central hubs of FDI, and many of them are also important port cities. Secondly, the sources of FDI are in Europe and America, and the main destinations are located in Asia. In addition, based on correlation test, betweenness centrality are positively related with the number of multinational enterprises (which is also the transfer stop of foreign investment), which is coincident with MNCs and FDI theory and the relationship will be tested in regression analysis. Lastly, the three regions in the center of the FDI network overlap with the three clusters of port cities, and these clusters are Asia, Europe and America.

4.1.2 Network analysis of port network

In order to illustrate the structure of port networks, centrality analysis is main instruments. Firstly, the network data of the transshipment situation is analyzed. In order to simplify the analysis, the centrality and coreness are calculated to show the structure of port networks. Transshipment condition is divided into three situations. The first value is there is non-stop container route between two port cities (the value of this situation is indicated by the number 2). The second one situation concerns container routes with transshipment between two port cities (the value is 1), and in the third situation, there are no container routes between two port cities (the value is 0). In order to do a cohesive analysis, the network data should be dichotomized and symmetrized. Firstly, the value of 1 is defined as a cut-off value; if the value in the matrix is greater than 1, then it will be recoded as 1. Values less than or equal to 1 are recoded as 0. Secondly, the dichotomized matrix is symmetrized by the minimum method, which means choosing the smaller values between two port cities.

In the table below, there are top 10 port cities measured using eigenvector centrality and coreness. It shows that the core region of port networks is in Asia due to the fact that there are 8 Asian port cities in top 10 cities. This result is coincident with the trend of port development; instead of Europe, Asia has become the main cluster of container ports in recent decades. Furthermore, the port cities with large population are always handle the

biggest cargo such as Shanghai and Hong Kong and Singapore, this concentration of port activities in global cities will constraint the development of other cities (Ducruet, 2006). Take Ningbo as example, the development of maritime industry will be limited by Shanghai in the same region. This will be discussed in the part of prescriptive analysis.

Table 11 Top 10 cities measured by Eigenvector centrality and Coreness (Source: Author, 2014)

City	*Eigenvec*	*Coreness*
Shanghai	0.477	0.557
Ningbo	0.443	0.486
Hong Kong	0.427	0.389
Singapore	0.417	0.324
Qingdao	0.262	0.275
Xiamen	0.189	0.174
Rotterdam	0.158	0.150
Hamburg	0.126	0.121
Tianjin	0.122	0.104
Dalian	0.090	0.091

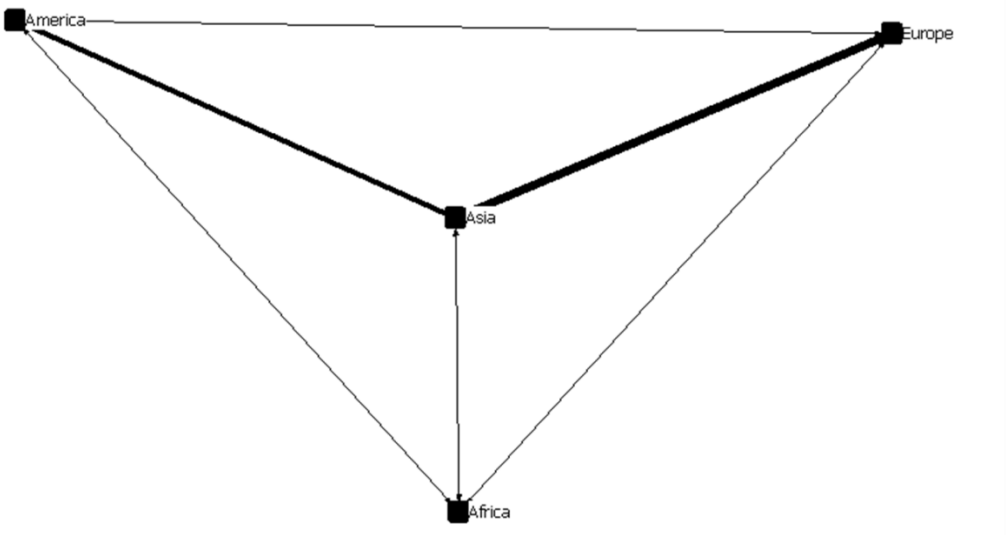
In addition, betweenness centrality shows to what extent a port city is able to fill in the structure hole between other two port cities. In this measurement, the structure of port network shows more balanced structure than eigenvector centrality. The result shows similar geographical distribution pattern with FDI network. Each region has its own transportation hubs with similar level of betweenness centrality. Specifically, Hong Kong, Shenzhen, Ningbo and Shanghai are centers of Asian port cities. Hamburg, Bremen and Rotterdam compose the core cluster of European port cities, and Dubai is the center of the Middle East. New York and Houston are at the center of American port cluster. This structure shows the trend of regional competition between port cities. However, different regions have different competition patterns. In Europe, port cities compete for overlapping hinterland, but in Asia, ports compete for transshipment flows (Transshipment refers to the handling of containers from one ship to another without using port terminals or inland generated products) (Ducruet, 2006). The different of competition pattern will be used for the two cities in different regions.

Table 12 Top 10 cities measured by betweenness centrality (Source: Author, 2014)

City	*World Region*	*Betweenness*
Hong Kong	Asian and Pacific	43.039
Hamburg	West Europe	34.396
Dubai	Middle East	31.955
Shenzhen	Asian and Pacific	20.105
Rotterdam	West Europe	19.921
New York	North America	18.535
Houston	North America	16.782
Bremen	West Europe	15.819
Shanghai	Asian and Pacific	15.059
Ningbo	Asian and Pacific	15.059

The port network can also be analyzed by cohesive subgroups. According to the clique analysis and the faction analysis, the structure of port networks is not too clear because this port network is quite a complete network. Due to this issue, the network between port cities is simplified to the network at regional scale. In the Figure 4.3, cities are grouped into 4 regions (Asia, America, Europe and Africa), and the strength of ties shows the frequency of container routes between regions. In this network, there is a similar structure with FDI networks: Europe, Asia and America are the three main clusters of hub ports, especially for port cities in Asia. As an area with a large number of emerging port cities, Asia is the main freight station of the world.

Figure 14 Regional structure of port network (Source: Author, 2014)



In comparison with the result of the urban network analysis, this section has some similar findings on the structure of networks. It is clear that there is some overlaps between port networks and urban FDI networks. Asia, America and Europe are the three main clusters of hub ports. Moreover, Asian port cities are at the center of the network by the measurement of coreness and eigenvector centrality. Concentration of port activities means more fierce competition between port cities. The finding shows a severe condition for development of Asian port cities like Ningbo.

4.1.3 QAP Correlation test of FDI and port network

In order to do QAP correlation test, 50 port cities are selected from urban network to match with port network. The urban network made up of FDI number and port network made up of number of container routes are used for QAP correlation test.

Table 13 Result of QAP correlation test (Source: Author, 2014)

Obs	Value	Significance	Average	Std. Dev
Pearson Correlation	0.140	0.014	0.000	0.039

In Table 4.7, Pearson Correlation is useful to this research because the data are valued matrixes. The value is the correlation coefficient of these two networks, and the significance value is 0.014, meaning that the relationship between the two networks is acceptable. In this case, the Pearson Correlation is 0.140, showing that there is a positive relationship between the level of port activeness and urban competitiveness. Associating the result with FDI and port competitiveness theory, Frequency of container route is an indicator of maritime connectivity (an aspect of port competitiveness). There is no doubt that port cities should improve the level of maritime connectivity to hence their positon in port network. Furthermore, Wilmsmeier and Sanchez (2009) reported that port connectivity has positive impact on reducing transport cost; which is identical with efficiency-seeking motivation of MNCs' foreign investment. Therefore, it is necessary for a port city to enhance port connectivity to improve their position in urban FDI network.

The result also provides enough support to the collaboration strategy for the port cities, if a port city wants to improve its urban competitiveness, it should make full use of its port activities and port-related industries for urban development, and the prosperity of the port will lead to the improvement of urban competitiveness for the port city.

4.2 Regression Analysis

From the network analysis, it is obvious that port activities will affect urban competitiveness. Logically, the next step will be to conduct a regression analysis in order to find determinants of port city competitiveness. In this section, the regression model will be explained in detail.

The data is processed using several steps. First, missing values in the database are replaced by the mean of values of the variable. Secondly, the normality of each variable is tested by histograms; these graphs show that some variables are skewed, and the solution is to calculate

the logarithm of skewed variables to replace former one. In this case, dependent variables are transformed to logarithm, as well as some independent variables with problem of normality. As a result, this multiple regression model will become a logarithmic model and the interpretation pattern will also be different from normal models.

There will be two regression models in this network: the first one is a comparison of inward FDI values between port cities and general cities to see whether port city has advantage over general cities in attracting FDI, and the second one is a model for only port cities in order to identify the determinants of urban competitiveness.

4.2.1 Comparison of port cities and general cities in attracting FDI

The first model consists of 50 port cities and 50 general cities. In this model, Inward FDI value is used as dependent variable for this model as indicator of urban competitiveness. The independent variables are input and outcome factors of urban competitiveness gathered from Global Urban Competitiveness Report (2011). In this section, an important dummy variable is added in the regression model that shows whether a city is port city or general city; the value of a port city is 1, and the value of general city is 0. The purpose of this model is to test whether a port city has an advantage over general cities.

In is the table of the regression model result. In the significant independent variables, there are several variables in the log pattern because they do not meet normal distribution. The dependent variable, the number of multinational enterprises and the GDP are transformed to log form in this model.

Table 14 Result of regression model of port cities and general cities (Source: Author, 2014)

Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	1.303	.297	4.380	.000
Log multinational enterprise	.856	.106	8.077	.000
04 Real GDP growths (%)	4.532	.852	5.319	.000
Log GDP per square KM	-.255	.082	-3.119	.002
Log GDP	.228	.075	3.053	.003
Port or not	-.155	.066	-2.340	.022

a. Dependent Variable: Inward FDI

The coefficients show the aspects of urban characteristics that will affect the attractiveness of FDI. The first one is the number of multinational enterprises; every 1% increase of multinational enterprises will increase FDI by 0.9%. As the hubs of foreign investment, multinational enterprises are an indicator of the capacity for a city to attract FDI. The next aspect is the economic condition. Foreign investments will choose cities with a large market size and a bright development perspective. If the GDP of a city increases by 1%, the FDI will increase by 0.313%. If the real GDP growth increases by 0.01, the FDI will increase by 4.39%.

The most essential variable is the dummy variable that identifies whether a city is a port city

or a non-port city. The coefficient of this dummy variable illustrates that as a port city, the value of FDI will decrease by 18.5%. In conclusion, when compared with general cities, port cities are weaker in their capacity to attract foreign investment than general city.

This observation can be explained by two reasons. The first one is negative impact of port activities on urban development. As discussed in literature review, the economic benefits spillover to adjacent regions (OECD, 2013). However, negative impacts in environmental and social aspects are localized in the local area. However, the specific reasons need to be analyzed by further research on differences between port city and general city. On the other hand, the patterns of regional urban network maybe another reason for weakness of port city in attracting FDI. In Europe, port cities need to serve for hinterland as a transport center, its development is also limited by inland cities like London, Paris and Madrid. In Asia, the concentration of port activities (Ducruet, 2006) in global cities like Shanghai, Hong Kong and Singapore also limits the futher development of other port cities like Ningbo. According to this result, the comparison between selected cities (Ningbo and Rotterdam) and cities in the same region (both general cities and port cities) should be done in prescriptive analysis.

To sum up, the conclusion of this regression model is that port cities are weaker than general cities in attracting FDI. However, based on network analysis, port network have positive relationship with FDI network, which means at least in port city system, port prosperity is important to attract FDI and improve urban competitiveness. The further regression study will be done to find the determinants of urban competitiveness of port city, mainly the factors about port competitiveness.

4.2.2 Determinants of urban competitiveness of port cities

In the next regression model, the inward FDI value is also set as a dependent variable. Independent variables include factors of port competitiveness (maritime connectivity, port efficiency, hinterland connectivity and other port characteristics) and factors of urban competitiveness in GUCR (input and outcome factors). In addition, three types of centralities are added in the model as the indicator of maritime connectivity.

Table 15 Result of Regression model of port cities (Source: Author, 2014)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.950	.449		2.116	.041
Log multinational enterprise	.622	.112	.423	5.542	.000
Real GDP growths (%)	5.090	.836	.430	6.089	.000
Log GDP	.367	.104	.317	3.528	.001
Log GDP per capita	-.503	.114	-.433	-4.405	.000
Log nEigenvec_D	.391	.209	.121	1.868	.069
Rail	-.334	.127	-.168	-2.629	.012
I4 Inner Structure	1.557	.535	.234	2.908	.006
Log ship calling	.090	.045	.139	2.020	.050
Maximum Size Vessel	.132	.078	.108	1.685	.100

a. Dependent Variable: Inward FDI

The variables with log in front of variable name are recoded using Logarithm. From this result, there are several variables that have a positive or negative impact on urban competitiveness, which could be divided into port characteristics and urban characteristic. Significant factors in urban characteristics contain number of multinational enterprises, Real GDP Growth, GDP, GDP per capita and Inner Structure. Port characteristics include Eigenvector centrality of transshipment condition, Rail (whether there is transit service by railway in a certain port), ship calling at a certain port (this data is real time data and been searched in one day to make them comparable) and Maximum Size Vessel.

Based on FDI theory, there are four main aspects of attracting FDI, which are market-seeking factors, efficiency-seeking factors, strategic asset-seeking factors and institutional environment. So the significant variable could also be grouped in these four groups: the first one is market seeking motivation, which could be represented by GDP and real GDP growth rate to show the market size and potential of marketing expanding. The second one is institutional environment factors, which could be represented by number of multinational enterprise and inner structure, because they are the performance that shows good business environment of a city. The third one is efficiency-seeking factors, which contains GDP per capita, ship calling, Eigenvector centrality of transshipment condition and Maximum Size Vessel. These three groups will be illustrated separately.

Market-seeking factors represent the motivation for MNCs to invest in certain city. In this group, GDP measures the market size of a port city; every 1% increase in GDP will cause a 0.367% increase in inward FDI value. Another variable in this group is real GDP Growth Rate that refers to the potential to expand market size. The coefficient shows that rate

increased by 5.09% in inward FDI value by 1% improvement itself. It is obvious to see that cities with a larger market size and bright potential to expand its market will be more attractive to foreign investment.

The second group concerns institutional environment. The number of multinational enterprises and the index of inner structure are significant in this aspect, which are all performance of a good institutional environment in a port city. Number of MNCs shows the attractiveness of a certain port city to these hubs of FDI, when there is 1% more multinational corporations are attracted in a port city, the value of FDI will increase by 0.622%. On the other hand, inner structure is a comprehensive indicator of institutional environment refers to the interactions between local enterprises in economic, political, social and cultural aspects. When the value of inner structure increases by 0.01, the FDI value will be 1.55% higher.

The most important group is efficiency-seeking factors. In this aspect, urban characteristics and port characteristics will be illustrated separately. GDP per capita is a substitute variable of labor cost because higher productivity will cause higher wage level. It is not surprised that GDP per capita has negative impact on inward FDI, when GDP per capita increase 1%, the Inward FDI value will decrease by 0.503%. This result could explain why MNCs prefer to invest in developing countries. As an MNC with efficiency-seeking motivation, it needs to invest in a place with lower labour cost.

In this group, more important variables are factors of port competitiveness, which consist of maritime connectivities, port efficiency, hinterland connectivities and natural condition of a certain port.

In terms of port efficiency, ship calling at a certain port is the only significant variable in this aspect. 1% increase in ship calling at certain port will lead to a 0.09% incensement in the inward FDI value. It is not a big impact but still show necessity to increase port efficiency.

Then, port connectivity is represented by eigenvector centrality of transshipment condition. When the centrality increases 1%, inward centrality will increase by 0.391%. (If the significance level is 0.1, the result is acceptable). For a port city, improving the level of port connectivity means enhance the position in port network, according to result of QAP test, it is also helpful to enhance the position in urban FDI network.

In terms of natural condition of port, maximum size vessel is significant and has positive impact on urban competitiveness. Maximum size vessel has two values; the value 2 means that the port can accommodate a vessel over 500 feet, and the value 1 means that the port is unable to accommodate such a big vessel. When the value is 1, the FDI value will be 13.2% higher than port cities with the value of 0 (If the significance level is 0.1, the result is acceptable).

Final part is hinterland connectivity. The significant factor is Rail (whether a certain port has transit service by railway). However, the coefficient of Rail is negative, which shows that if there is railway transit service, the inward FDI value will decrease by 33.4%. This is opposite with the port competitiveness theory because the availability of railway service should have positive impact on port competitiveness and will be helpful to decrease production cost. However, for the choice of FDI destination is not only efficiency-seeking strategy. Based on

port-city relationship theory, maritime industry has negative impact on environmental and social aspect like port noise and air emission. Therefore, the negative impact is probably the consequence of interaction of these two opposite forces.

To conclude, the result of regression analysis not only provides evidence to network analysis, but also provides basis for policy recommendation for selected cities. First, cities with larger market size and higher potential to expand market size will be attractive for inward FDI. In terms of institutional environment, cities with more MNCs and higher level of inner structure would be attractive to foreign investment. Efficiency-seeking motivation of foreign investment are represented by CDP per capita and port characteristics, in which former one is an substitute variable of wage level, while the latter one prove the importance of port competitiveness that could reduce transport cost for MNCs and satisfy their efficiency-seeking motivation. As a certain port city like Ningbo and Rotterdam, it is important to compare these variables with cities in the same region and make targeted policy.

4.3 Prescriptive Analysis

In this part, the analysis will be focus on Rotterdam and Ningbo. The results of network analysis and regression analysis are used to ensure their position in urban network and port network, as well as compare the value of significant variables of them with that of cities in the same region. In this section, background information of two cities will be given first. Afterwards, Ningbo and Rotterdam will be compared with cities in same region. Furthermore, based on the regression model, the strengths and weaknesses of these two cities will be apparent and so will be the need for policy recommendation.

4.3.1 Regional Comparison of Ningbo

Ningbo is a port city in the Southeastern coastal area of China; it is located in the central part of Zhejiang Province, which consists of 6 districts, 2 counties and 3 cities without districts. In 2012, the total area of Ningbo is 9365 square kilometers and it has a total population of 660.86 million (Municipality of Ningbo, 2013).

Compared with other cities in the same region, the location condition of Ningbo is quite advantageous. Firstly, Ningbo is in the middle of the Chinese coastline, and the urban area is located on the delta region formed by three rivers. Obviously, this locational factor gives Ningbo a natural talent for a port and ocean economy. Moreover, as an important logistic center in the south wing of the Yangze Delta Region, Ningbo is located within a two-hour transportation circle of Shanghai, which means it can enjoy the benefit of an economic radiation effect from Shanghai. Finally, the opening of the Hangzhou Bay Bridge in 2008 created three outcomes for Ningbo: it brought an end to the geographic isolation of Ningbo from other important cities; it transferred Ningbo from a transport terminal to a transport hub in the southeast of China; and it provided an incomparable position for this city.

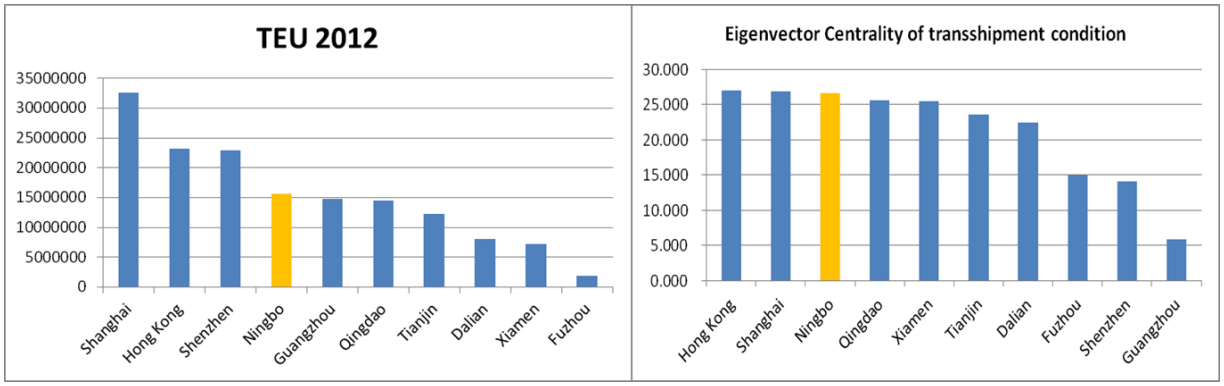
In addition, the rapid development of Ningbo can also be attributed to the promotion of its legal status, especially the obtainment of a sub-provincial administrative status and a separate state-planning status in 1994. The former status provides a higher level for the chief officials

of Ningbo, which means that the officials have more power in the policy-making process. Additionally, the latter status empowers the local government of Ningbo to draw up development plans on their own without political intervention from high-level authorities. With these legal statuses, Ningbo is able to make full use of their resources and of the support from policies to advance its urban competitiveness.

The city vision of Ningbo is not only a port city but also an attractive international coastal city. Its urban orientation can best be summarized by its city slogan—"Books contain the history, Ports connect the world." The role of Ningbo can be separated into three scales: a regional scale, a national scale and an international scale. At the regional level, Ningbo is the southern economic center of the Yangtze Delta Region, working as an advanced manufacturing base, a modern logistics center and a transportation hub. At the national level, Ningbo is an important foreign trade port in the Southeastern coast of China. It is a famous historical city, and it is also one of the top 10 livable cities in China. At the international level, Ningbo is the shipping center of the Northeast Asia.

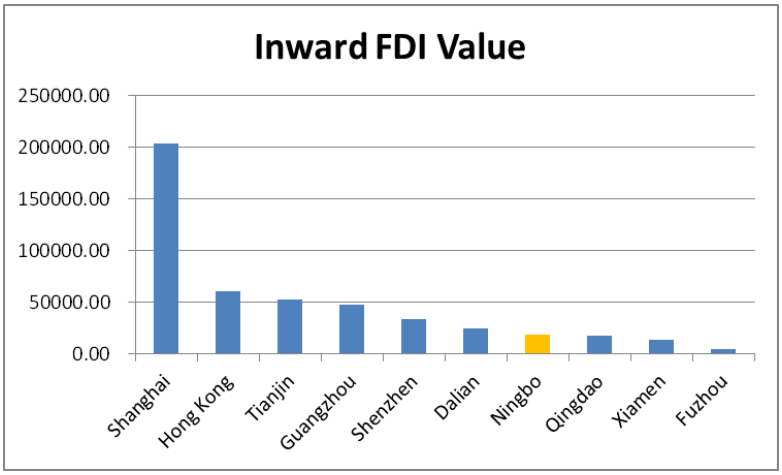
The direct competitors of Ningbo are port cities in the same region because Asian coastal cities have advantage over inland cities in urban development (see chapter 2). Chinese port cities in the city list will be selected for comparison with Ningbo. In the aspects of port performance (see Figure 4.4), Ningbo is the fourth biggest port in China. The three cities with a larger container throughput than Ningbo are Shanghai, Hong Kong and Shenzhen. In terms of centrality of transshipment condition, Ningbo ranks the third in these cities. There is no doubt that Ningbo is an important port as a regional transit hub for containers and other goods when compare with other Chinese port cities.

Figure 15 Comparison of TEU between Ningbo and Chinese port cities (Source: Author, 2014)



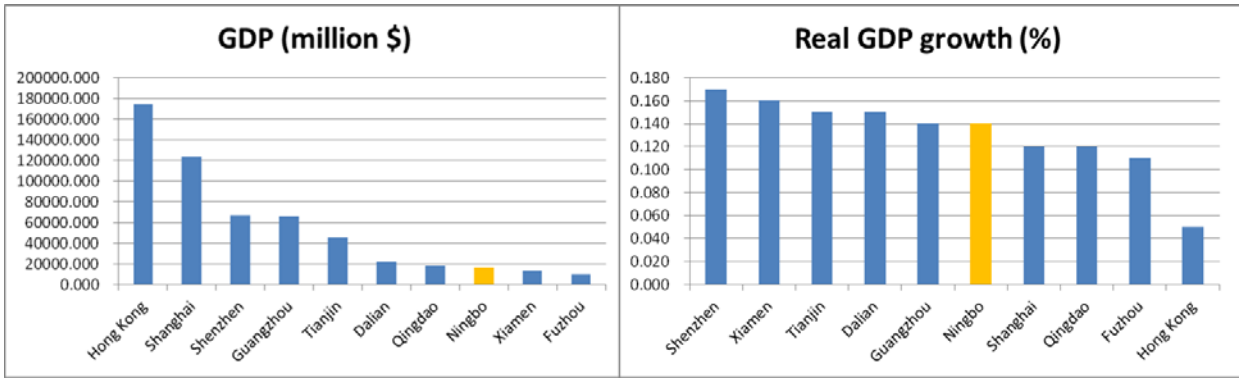
Although Ningbo is a strong port in port activities, in terms of urban competitiveness, Ningbo is weaker than its main competitors in attracting foreign investment. In Figure 4.5, it is easy to see that Ningbo is not the first choice of foreign investment, and the attractiveness of Ningbo is much lower than Shanghai (the central city in Yangzi River Delta Region). It is obvious that Ningbo is not in the center of FDI network, even in regional scale. As the result of network analysis, Asia is the main destination of foreign investment, if Ningbo could not improve its position in this network, it will lose many chance for urban development.

Figure 16 Comparison of inward FDI value between Chinese port cities (Source: Author, 2014)



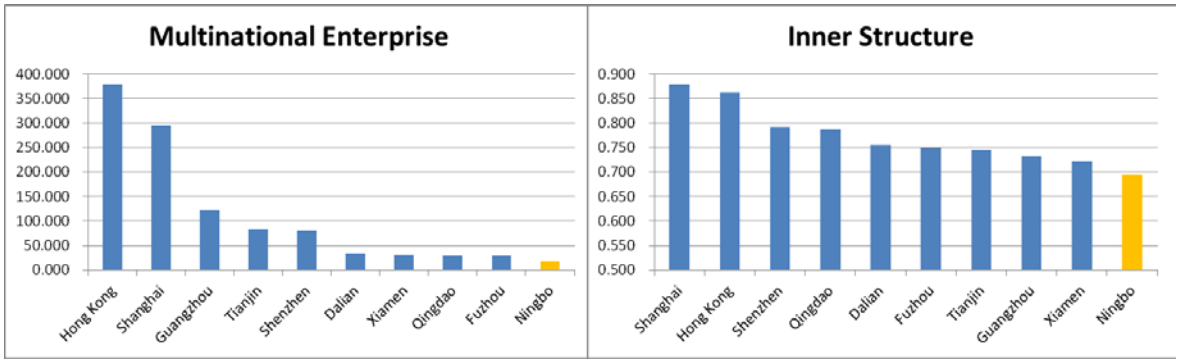
The concern is what are strength and weakness of Ningbo in attracting FDI. First of all, the market size factors of these cities are compared. In terms of GDP (indicator of market size), Ningbo is shown to be in the fourth lowest position. Besides market size, Ningbo has also no advantage in the potential of market expansion compared with Chinese competitors. However, due to overall rapid growth of Chinese economy, Ningbo is experiencing a period of sustained and steady growth in economic volume and market size and it has advantage in this aspect compared with competitors outside its region.

Figure 17 Comparison of GDP and GDP growth rate (Source: Author, 2014)



Afterwards, the institutional environment is analyzed by two significant variables in regression analysis, including number of multinational enterprise and inner structure. In respect of multinational enterprise, Ningbo shows the least attractiveness to MNCs, it could be explained by the economic structure that local private enterprise is main component of economic entities. However, MNCs is the conductor of foreign investment and the performance of institutional environment, if Ningbo wants to improve its position in global urban network, the municipality of Ningbo should improve its economic openness to attract MNCs and seek for cooperation with Shanghai and become the sub-center of the Yangzi River Delta Region. The comparison of inner structure also shows the same result, which means Ningbo need to improve the quality of public service and enhance interaction between economic entities.

Figure 18 Comparison of institutional environment (Source: Author, 2014)



In the aspect of efficiency aspect, Ningbo has no advantage in reduction of labor cost. However, factors of port competitiveness provide Ningbo with advantage to reduce transport cost. In table 4.11, there is a simple comparison of main indicators of port competitiveness (TEU represents port efficiency, Maximum size Vessel refers to natural condition, and Eigenvector centrality represents maritime connectivity). There is obvious advantage for Ningbo in port competitiveness especially in maritime connectivity.

Table 16 Comparison of port competitiveness (Source: Author, 2014)

City Name	TEU 2012	Maximum Size Vessel	nEigenvec
Ningbo	15670000	2.000	26.642
Average	15288983	1.300	21.261

In conclusion, the problem of Ningbo is the segregation between port activities and urban competitiveness. Port industries fail to provide more added-value to the other dimension of urban competitiveness, especially in terms of market size and attract institutional environment. However, Ningbo takes advantage in port competitiveness when comparing with other Chinese port cities. Therefore, Ningbo should make full use of its strength in port characteristics to consolidate its position in the port network, and try to improve the attractiveness to MNCs.

4.3.2 Regional Comparison of Rotterdam

Compared with emerging port cities in Asia, Rotterdam has already experienced prosperity for hundreds of years. It is a hub port of the world located in Western Europe. Nowadays, Rotterdam port is still the biggest container port in Europe. In 2012, the container throughput of Rotterdam achieved 11865916 TEUs, which put Rotterdam in the top ranking in the port cities selected in Europe. Aside from this, Rotterdam showed a remarkable rebound in container market share from 32.5% to 35.1%, and the city sustained its positon as the second most central cargo hub in the world (OECD, 2013). Rotterdam is also considered as the most efficient port in the aspects of container and oil (OECD, 2013). Within the Randstad region, Rotterdam is the center of the southern wing of this region, and it is an important center of innovation (Rotterdam Urban Vision).

However, nowadays Rotterdam has been facing some pressure in both its port networks and

urban networks. In its port network, the tremendous growth of emerging port cities in Asia has placed pressure on Rotterdam as the global central hub for container and oil. The negative growth in container throughput also threatens the position of Rotterdam in the European port network. This danger can be easily seen when looking at the port characteristics data of European port cities.

In its city region, the position of Rotterdam is also not sustained because of a slower development of the knowledge economy in the south wing of Randstad when compared with the north wing. This fact can be clearly shown by the comparison between Rotterdam and the representative of the north wing, which is Amsterdam according to FDI and urban characteristics. In the table of FDI, Amsterdam has obvious advantages in both number and value, especially in outward investment; this means that Amsterdam is already a financial hub of the world, but Rotterdam is only a hub of goods and resources.

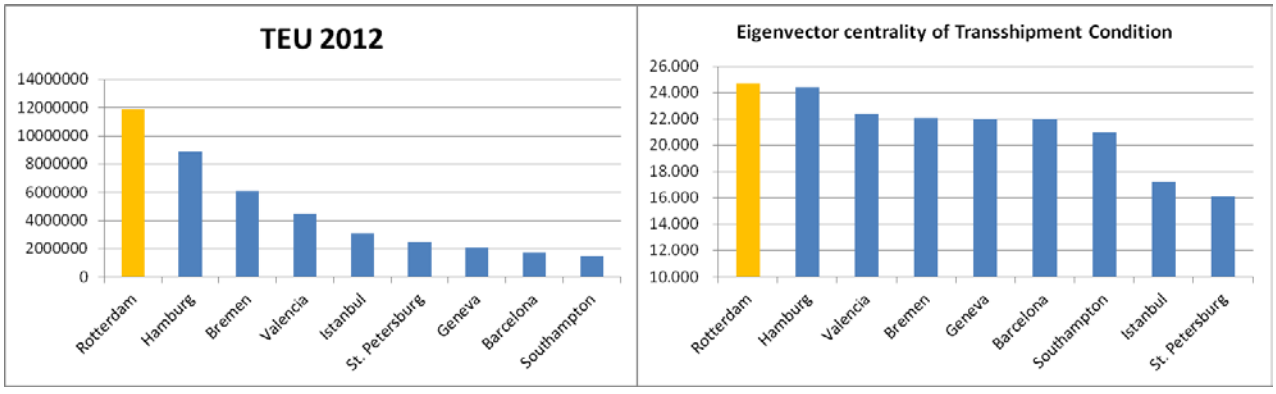
Table 17 Comparison of FDI between Amsterdam and Rotterdam (Author, 2014)

City	Investment Number	Investment Valued	Investment Number	Investment value
Amsterdam	524.00	16962.68	550	28309.16
Rotterdam	136.00	11821.59	84	3481.12

In order to show the strength and weakness of Rotterdam in regional scale, port cities in Europe are selected to do the comparison of factors of port competitiveness, and then ,both port cities and general cities in west Europe are chosen to compare with Rotterdam in urban characteristics.

In Figure 4.8, there is no doubt that Rotterdam is in the center of European port network, both TEU and eigenvector centrality are at the top of these cities. However, the position is not that steady because there are competitors like Hamburg, and Bremen in the same region (Antwerp is not included due to lack of data in GUCR). In regional scale, port cities in west Europe are stronger than port cities in East Europe like Istanbul and St. Petersburg.

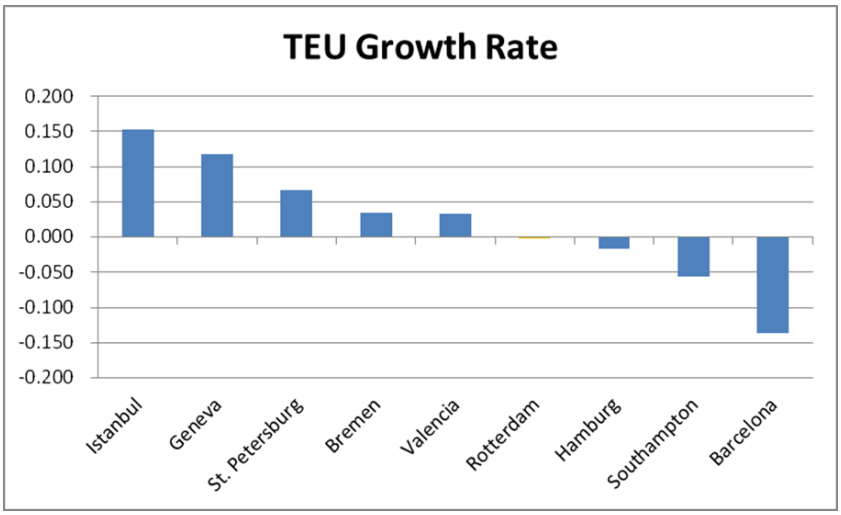
Figure 19 Comparison of port efficiency for European port cities (Source: Author, 2014)



However, in terms of growth rate of container throughput, port cities in East Europe have a strong trend of increasing in TEU, while West European port cities all suffer from stagnation

or rescission in container throughput. In the future, Rotterdam will face fierce competition coming from both emerging ports in East Europe and mature ports in West Europe.

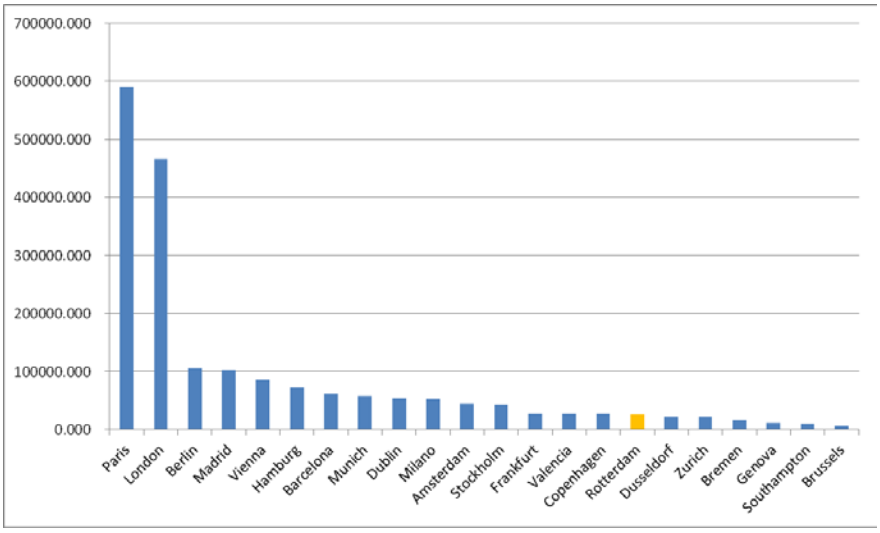
Figure 20 Comparison of TEU Growth Rate (Source: Author, 2014)



In the comparison of urban characteristics, Rotterdam will be compared with other port cities and general cities in Europe because in Europe, port city has no advantage compared with general city in urban development.

Similarly, GDP and GDP growth rate are used to represent market-seeking factors of attracting foreign investment. As the result, Rotterdam is quite weak in market size when compare with general cities like Paris, London and Madrid. In comparison with port cities like Hamburg and Barcelona, Rotterdam has also no advantage. In Figure 4.10, the structure of European urban network is clear that inland cities are always stronger in urban development, while port cities are only transport center serving for their hinterland with little attractiveness to other industries.

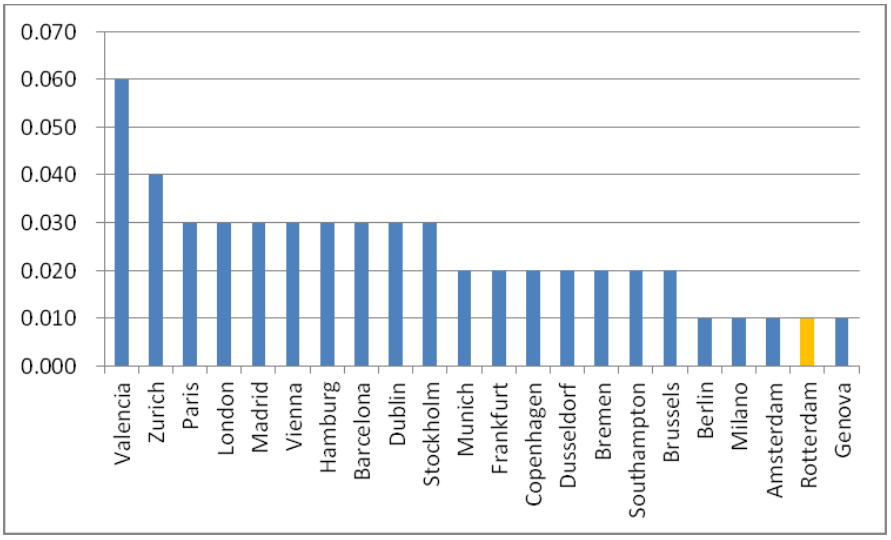
Figure 21 Comparison of GDP for West Europe cities (Source: Author, 2014)



In terms of GDP growth rate, Rotterdam seems to be experiencing a period of slow economic development. The growth rate of GDP seems to be lower than all selected European cities. It is obvious that Western Europe has not yet recovered from the economic crisis. However,

lack of potential in market expanding will have negative on the attractiveness of foreign invest.

Figure 22 Comparison of GDP growths for West Europe cities (Source: Author, 2014)



In the aspect of institutional environment, number of Multinational enterprise and inner structure are compared between European cities. In Figure 4.12, Rotterdam occupies the fourth lowest position in ranking of number of multinational enterprise. In terms of inner structure, Rotterdam is in the fifth lowest position. Compared with general cities, Rotterdam is weaker to build a good business environment and attract more multinational enterprise and foreign investment than other general cities like London, Paris and Madrid. This phenomenon is coincident with the pattern of European urban network that general city has advantage in urban development.

Figure 23 Comparison of Multinational enterprises (Source: Author, 2014)

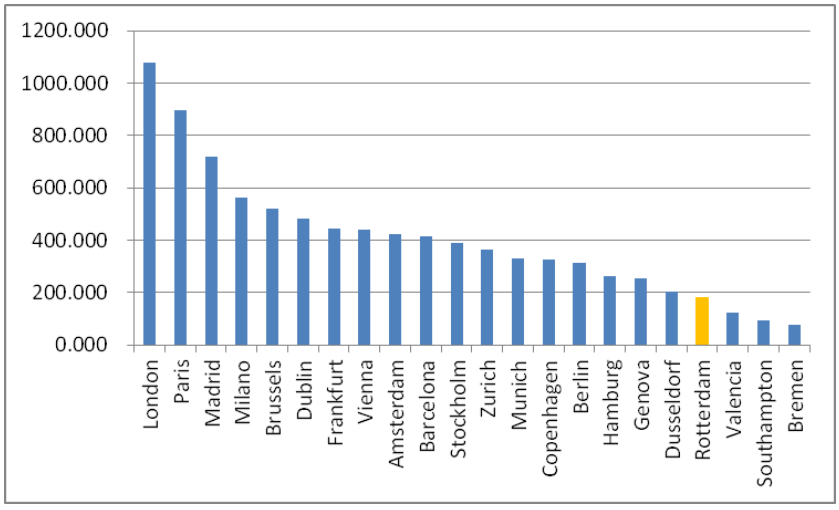
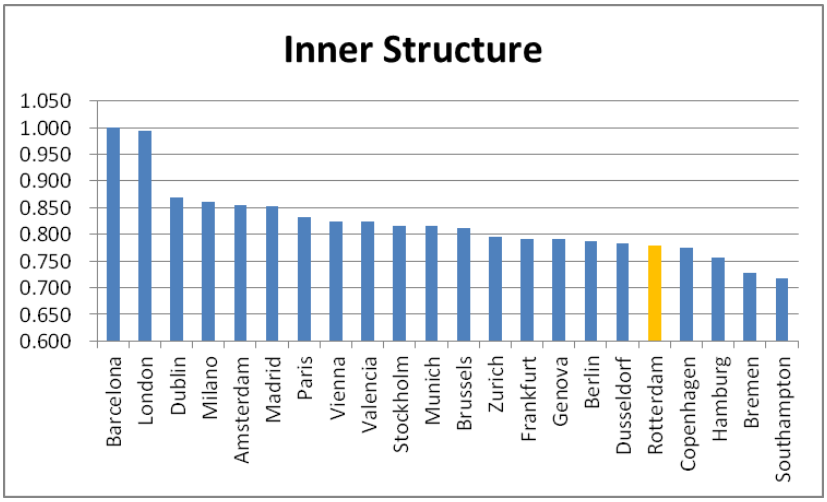


Figure 24 Comparison of inner structure of west European cities (Source: Author, 2014)



In port characteristics (see Figure 4.14). Rotterdam has obvious advantage in port performance (TEU), natural condition (Maximum Size Vessel) and maritime connectivity (eigenvector centrality of transshipment condition) over the average level of European port cities. As the main transport hub in Europe, Rotterdam must take advantage of port competitiveness to improve attractiveness to foreign investment.

Table 18 Comparison of port characteristics for European port cities (Source: Author, 2014)

City Name	TEU 2012	Maximum Size Vessel	nEigenvec
Rotterdam	11865916	2.000	24.725
Average	4692630	1.444	21.348

All in all, Rotterdam and Ningbo faces similar situation in regional competition. They have clear strength in port competitiveness, as well as similar weakness in urban characteristics to attract foreign investment. So the basic strategy for two cities will be similar, which is internalizing the benefit of port competitiveness and improving other urban characteristics that have impacts on urban competitiveness (Inward FDI). However, policy recommendation for two selected cities should be linked with regional context (However, data limitation makes it impossible to test the difference in factors of urban competitiveness of port city; this will be future direction of study.

4.3.3 Strength and weakness of Ningbo and Rotterdam

In Table 4.14 and Table 4.15, the strength and weakness of Ningbo and Rotterdam are given by comparison with regional average level. Ningbo will compare with port cities in China, while Rotterdam will compare with port cities in West Europe. The determinants of Attracting FDI will be put into three groups: market-seeking factors, efficiency-seeking factors and institutional environment factors, it is important to emphasize that port characteristic are in efficiency-seeking factors as the factors to reduce transport cost for MNCs and attract more foreign investment.

In figure 4.14, the determinants of inward FDI are grouped into efficiency-seeking Factors, Market-seeking factors and Institutional environment. In each column, the value of Rotterdam is compared with European port cities, the yellow unit means Rotterdam has strength in this factor (the value is bigger than average), while the green unit means Rotterdam has weakness in this factor (the value is smaller than average). These two tables will be basis of policy recommendation in Chapter 5.

Table 19 the strength and Weakness of Rotterdam (Source: Author, 2014)

	Port competitiveness			Urban competitiveness factors					FDI
	Efficiency-Seeking Factors				Market-Seeking Factors		Institutional environment		
City Name	Ship Calling	Maximum Size Vessel	nEigenvec	GDP per capita ($)	GDP (million $)	Real GDP growth (%)	Number of MNCs	Inner Structure	Inward FDI value
Rotterdam	646.00	2.00	24.73	43147.87	25505.14	0.01	184.00	0.78	11821.59
Average of European port cities	145.56	1.44	21.35	33960.74	39361.30	0.04	226.00	0.79	13453.26

Table 20 the strength and Weakness of Ningbo (Source: Author, 2014)

	Port competitiveness			Urban competitiveness factors					FDI
	Efficiency-Seeking Factors				Market-Seeking Factors		Institutional environment		
City Name	Ship Calling	Maximum Size Vessel	nEigenvec	GDP per capita ($)	GDP (million $)	Real GDP growth (%)	Number of MNCs	Inner Structure	Inward FDI value
Ningbo	55.00	2.00	26.64	9827.54	21442.72	0.14	86.00	0.70	18187.44
Average of Chinese port cities	200.70	1.30	21.26	10970.19	69744.88	0.13	312.30	0.77	47285.69

To conclude, characteristics of port competitiveness are main strength for Rotterdam and Ningbo, which will be helpful to reduce transport cost and achieve efficiency-seeking motivation of MNCs to invest. In terms of institutional environment, both Ningbo and Rotterdam need to improve their public service and business environment. In addition, regional context will influence the attractiveness of FDI, in terms of GDP growth and GDP per capita, Ningbo shows potential to expand the market (GDP growth rate is higher than average)and provide lower labor cost in China (GDP per capita is lower than average), while Rotterdam has higher wage level and lower growth rate. According to the result, policy recommendation will mainly focus on enhance port competitiveness and improve institutional environments, these two strategy should link with each other to make full use of port to improve urban competitiveness of poet city.

5. CONCLUSION

5.1 Introduction

In this conclusion sectors, main finding of this research would be linked with theory and shows the contribution to existing body of knowledge. It consisted of research objective, main finding of sub questions, the answer to main research questions, contribution to the existing body of knowledge and policy recommendation to Rotterdam and Ningbo.

5.2 Retrospect: Research objective

The objective of this research was to make full use of port characteristics to enhance urban competitiveness. It was divided into three sub-objectives. The first one is to analyze whether port activities have positive relationship with urban competitiveness. In the exploratory section, the purpose is to test whether port cities possess any advantage in attracting FDI over general cities and to identify determinants of urban competitiveness of port cities. In the final stage, result of former analysis especially regression analysis was used to find strengths and weaknesses of Rotterdam and Ningbo by comparing them with port cities and general cities in the same region. Afterwards, policies recommendations will be given to municipalities with the view of improving their urban competitiveness.

5.3 Conclusions and discussions:

5.3.1 Positive relationship between port network and urban network

In this section, the structure of urban networks was analyzed first, and there were several important findings.

In urban FDI network, different regions represented different roles. Asian cities seem to be the destination of inward investment, and many central cites in this network are port cities like Shanghai, Dubai and Singapore. On the other hand, Europe was the main source of outward investment, and the central cities are mostly inland cities like London, Paris and Madrid. This finding is the evidence of different urban network patterns in different regions. Urban development trend in Asia showed a trend of coastal location, biggest cities always located in coastal area as the hub of both investment and goods; however, the development of European port cities was limited by the spillover of positive externality to hinterland and over dependency on port activities. This find shows a limitation of this research, in the further research, regional context should be taken into consideration.

Turn to port network, there were three clusters for main port cities in the world, which are Asia, America and Europe. Based on centrality analysis, Asia is becoming the center of world port network in recent decades. It was also encouraging to see the overlap between urban network and port network, Shanghai, Singapore and Hong Kong shows there strong power in both network. Follow this track, the relationship between port network and urban network were tested by QAP correlation. **The result showed positive relationship between port activities and urban competitiveness**, there was no doubt that port could still be driven

force for development of port city. On the basis of it, there was a necessity to test what are determinants of urban competitiveness of port city.

5.3.2 Determinants of urban competitiveness of port city

There were two regression models in this section: the first one was to test whether port cities has an advantage in comparison with general cities, and the second one was only for port cities to find determinants of urban competitiveness of port cities.

When compared with general cities, port cities had a weakness in attracting FDI, which was the consequence of port city development pattern. The benefit of port activities such as added value to port-related industry and reduction of transport cost speared to adjacent regions through backward linkage (OECD, 2013), while the pollution, noise and other negative impacts were localized. However, the over dependency on port activities blocked other development approach for port cities and continued to worsen the situation, finally, it led to the segregation between a port and a port city in functional and spatial aspects. Based on this track, it was not surprised that port cities fail in the comparison with general cities. This result did not conflict with the result of QAP test because of different ranges of study. For port city, improving port competitiveness and global connectivities was essential for improving its position in urban FDI network. However, the side effects of port activities should not be neglected. In policy making procedure, municipality of port cities must weigh advantages and disadvantages cautiously.

The second regression model was to find determinants of urban competitiveness of port city. The significant variables could be classified into several groups by theory of foreign investment motivation. The first one was **market-seeking factors** that refer to MNCs' motivation to seek FDI destination with larger market size and better potential of market expansion. In this aspect, GDP (market size) and GDP growth rate (potential of market expansion) had positive impacts in attracting foreign investment. Second, **institutional environments** had positive effects on attracting FDI. In this aspect, number of multinational Enterprise and inner structure index are two significant variables. They were all performance of a good institutional environment. Port municipality should not only focus on port activities, but also provide better business environment to attract other economic sectors. The third group was **efficiency-seeking factors**, which referred to factors related to lower cost of production. This group contained GDP per capita and characteristics of port competitiveness. Former one had negative impact on urban competitiveness because higher productivity leads to higher wage level, which could not satisfy the need of MNCs. Similarly, port with higher competitiveness will reduce more transport cost. Therefore, indicators of port connectivities (eigenvector centrality of transshipment condition), port efficiency (ship calling) and natural condition (Maximum Size Vessel) had positive impact on urban competitiveness. These result showed the importance to enhance port competitiveness with the purpose of improving urban competitiveness. However, the negative impact of railway transit service should also be paid attention due to pollution and noise caused by port activities.

5.3.3 Strength and weakness of Rotterdam and Ningbo

The results from former analyses were used to identify the strengths and weaknesses of Rotterdam and Ningbo. They faced fierce competition with port cities and general cities in different regional context.

As the biggest port city in Europe, Rotterdam was strong in port competitiveness; however, compared with other global cities in the same region, Rotterdam shows weaknesses in market-seeking factors and institutional environment. Moreover, the growth of both GDP and container throughput are slower than its competitors. Therefore, Rotterdam faces fierce competition and needed to enhance both port competitiveness and urban characteristics. The situation of Ningbo was similar. Compared with cities in the same region, Ningbo has a better performance in port activities than that of urban characteristics like market size and institutional environment. The difference between Ningbo and Rotterdam is development trend, as an emerging port city in China, Ningbo showed strong potential in both port efficiency and economic development.

To conclude, Rotterdam and Ningbo should pay attention to improve urban characteristics, especially market size and building of institutional environment. On the other hand, these two cities have an advantage in port activities, so strategies on enhancing port competitiveness should be exerted to enhance their position in port network, which will be helpful to improve their power in urban FDI network.

5.4 Interpretation of the main research question

The main research question is **how to internalize advantage of port to improve urban competitiveness of port cities?**

The segmentation between port and port city had last for decades Holye (1988), and the functional and spatial segregation between port and port city seems to have significantly negative influence on urban competitiveness because comparing with general cities because port city was weaker in attracting foreign investment according to the result of regression model. However, OECD' port city competitiveness report showed that port still has benefit on increasing attractiveness of city by reducing transport cost and adding value to port-related industry, and there are an overlap between global cities and global ports (OECD, 2013). This theory provides the necessity to analyze whether port activities will increase urban competitiveness of port city. The result of QAP correlation test shows there is positive relationship between port network and FDI network. In other words, for port cities, port could still be driving force to enhance urban competitiveness. Then, based on FDI theory, urban characteristics and port characteristics are grouped into three motivation of MNCs' foreign investment (market-seeking motivation, strategic asset-seeking, and efficiency-seeking) and institutional environment for the purpose to find determinants of urban competitiveness of port cities. The result shows that market-seeking, efficiency-seeking and institutional environment are main determinants of attracting FDI for a port city, According to this result, both **diversification and combination strategies** should be adopted at the same time by municipalities of port cities,. Diversification means to attract other economic sectors other

than port-related industry, such as Finance, law and APS. In order to achieve this objective, better institutional environment needed to be built in port cities. On the other hand, combination strategy referred to link port function to urban development, and regard port as a special asset to attract related industries by enhance port competitiveness.

5.5 Contribution to existing body of knowledge

This research used empirical analysis to examine the relationship between a port network and an urban network, which provided evidence to port-city relationship pattern in a new view. It also compared urban competitiveness between port cities and general cities to show the weakness of current development pattern of port city, and it also identified determinants of urban competitiveness by using regression analysis.

5.6 Recommendation

The result showed two basic strategies for municipalities of Ningbo and Rotterdam. The first one was combination strategy in the purpose of enhancing port competitiveness in aspects of maritime connectivity, port efficiency as well as natural condition and infrastructure. Another one was diversification strategy to improve urban characteristics in institutional environments and markets conditions. To some extent these two strategies have conflict with each other due to the negative impacts of port activities. However, it is important for municipalities of Rotterdam and Ningbo to find a balance. As two strong cities, there were some beneficial experiences that can be used as reference by each other.

5.6.1 Combination strategy

In combination strategy, two successful experiences are given: collaboration with adjacent port (Ningbo) and enhancing linkage with hinterland (Rotterdam).

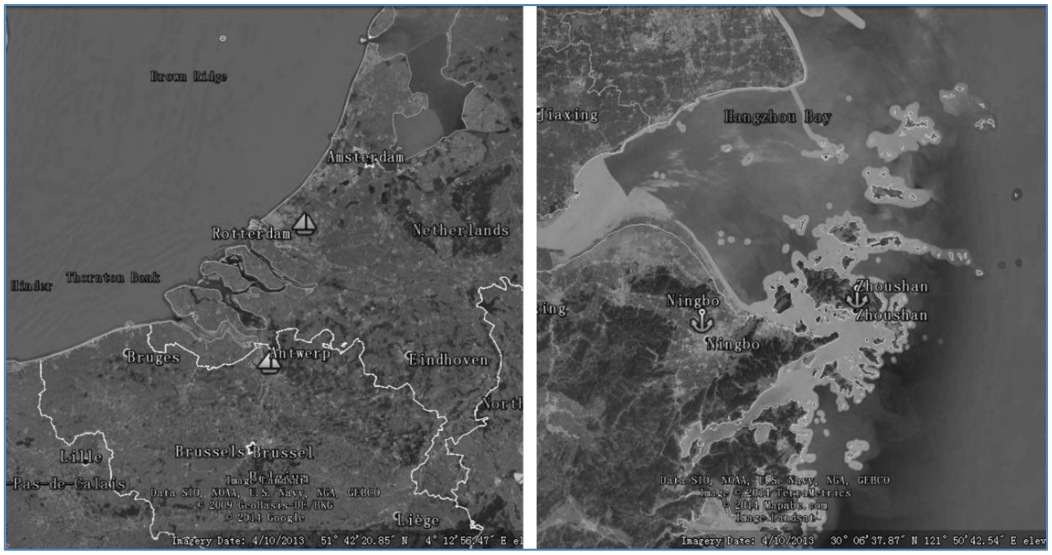
The first recommendation is collaborating with adjacent port to improve better natural condition, port efficiency and maritime connectivity.

The municipality of Ningbo has already collaborated with other ports like Shanghai and Zhoushan. Aside from Shanghai, Ningbo is the only port in the Yangzi River Delta Region that holds ocean routes. However, the natural condition of its port area is a limiting factor for further development, such as the serious pollution generated by port-related industries such as chemical industries. On the other hand, the Zhoushan port has an excellent natural condition, especially the depth of its channel and the length of its coastal area, but further development is limited by the shortage of financial support. Therefore, the collaboration between the two ports can make full use of each other in improving port competitiveness.

Rotterdam should also improve its collaboration with other ports in the same region. From the geographical perspective, the port of Antwerp is the most suitable collaborator in this region. However, in recent years, Rotterdam and Antwerp have become two main competitors that struggle for the central position in Western Europe. In the former analyses, it is clear that Rotterdam and Antwerp face fierce competition from Eastern European port cities such as Istanbul and Saint Petersburg. In addition, the development of Rotterdam and Antwerp has

been stalled due to issues with enlarging the container throughput. Rotterdam has always been the gateway to Europe and the biggest transshipment port in the world; nowadays it is the central port of Europe. Therefore, a relationship of collaboration and a combination of both the Rotterdam and Antwerp ports will be beneficial to both two port cities.

Figure 25 Collaboration between adjacent ports (Source: Author, 2014)



The second recommendation is enhance linkage with hinterland, which is an efficient tool to expand market size and improve level of hinterland connectivities.

In the European urban network, Rotterdam is an important transfer hub with a multiple-pattern transportation system. In this network, over 40% of trans-border European road transportation services are carried out by the Netherlands, and Rotterdam is the origin of this network. With such a complete road network, Rotterdam can consolidate its position as the gateway to Europe.

For the municipality of Ningbo, the connection to inland cities should be improved upon. As an emerging port city in the eastern coastal area of China, Ningbo did not get a good position in transportation network of Yangzi River Delta Region. For a long time, Ningbo is at the periphery of the transportation network. However, as explained in Chapter 4, the opening of Hangzhou Bay Bridge has changed the structure of its network. This bridge now connects Ningbo with Shanghai directly and since then, Ningbo has become the transportation hub in the south wing of the Yangzi River Delta Region.

This is only the first step for Ningbo to enhance its linkage with its hinterland. In the future, the municipality of Ningbo needs to strengthen its connection with inland cities and establish no-water ports in some important nodes. With this strategy, Ningbo can fortify its position as the main transport stop in Eastern Asia and be closer to the center of the FDI network due to the fact that a port network and an urban network have a positive relationship with each other.

5.6.2 Diversification Strategy

Port activities and port-related industries have both a positive and a negative impact on urban competitiveness. For example, the pollution caused by energy consumption and the ship-

repairing industry will deteriorate the environment which in turn will affect the urban competitiveness of the port city. In the urban vision of Rotterdam, the strategy is to transform its industrial economy to both knowledge and services economies on the basis of development of medical and creative sectors. Another focus will be on small and medium-sized enterprises, and this focus is coincident with the weakness of enterprise quality (Municipality of Rotterdam, 2014).

For the municipality of Ningbo, it is important to concentrate on the development of its ocean economy, which means developing its marine science and technology sectors on the basis of its geographical advantages and its port-related industries. The aim of this strategy is to increase the power of Ningbo in city region. In conclusion, the future orientation of development should be the focus on the transition of economies, and that port cities should make full use of their port instead of solely depending on them.

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ANNEX 1: City List

Note: in the second column, the city with value 1 is a port city, if the value is 0, it is a general city.

City	Port or not	World Region	Country
Shanghai	1	Asian and Pacific	China
London	0	West Europe	UK
Singapore	1	Asian and Pacific	Singapore
Dubai	1	Middle East	UAE
Beijing	0	Asian and Pacific	China
Hong Kong	1	Asian and Pacific	China
Nyc (Ny)	1	North America	United States
Paris	0	West Europe	France
Moscow	0	Rest of Europe	Russia
Sao Paulo	0	Latin America	Brazil
Bangalore	0	Asian and Pacific	India
Mumbai	1	Asian and Pacific	India
Madrid	0	West Europe	Spain
Tokyo	1	Asian and Pacific	Japan
Sydney	1	Asian and Pacific	Australia
Milano	0	West Europe	Italy
Mexico City	0	Latin America	Mexico
Warsaw	0	Rest of Europe	Poland
Guangzhou	1	Asian and Pacific	China
Bucharest	0	Rest of Europe	Romania
New Delhi	0	Asian and Pacific	India
Budapest	0	Rest of Europe	Hungary
Chennai	1	Asian and Pacific	India
Suzhou	0	Asian and Pacific	China
Brussels	0	West Europe	Belgium
Chicago (Il)	0	North America	United States
Shenzhen	1	Asian and Pacific	China
Kuala Lumpur	0	Asian and Pacific	Malaysia
Bangkok	1	Asian and Pacific	Thailand
Dublin	0	West Europe	Ireland
Frankfurt	0	West Europe	Germany

Seoul	0	Asian and Pacific	South Korea
Vienna	0	West Europe	Austria
Istanbul	1	Rest of Europe	Turkey
Tianjin	1	Asian and Pacific	China
Buenos Aires	1	Latin America	Argentina
Toronto	0	North America	Canada
Amsterdam	0	West Europe	Netherlands
Bogota	0	Latin America	Colombia
Prague	0	Rest of Europe	Czech Republic
Pune	0	Asian and Pacific	India
Hyderabad	0	Asian and Pacific	India
Barcelona	1	West Europe	Spain
Johannesburg	0	Africa	South Africa
Stockholm	0	West Europe	Sweden
Cairo	0	Africa	Egypt
Melbourne	1	Asian and Pacific	Australia
Doha	0	Middle East	Qatar
Hanoi	0	Asian and Pacific	Vietnam
Zurich	0	West Europe	Switzerland
Taipei	0	Asian and Pacific	Taiwan
Santiago	0	Latin America	Chile
Munich	0	West Europe	Germany
Kiev	0	Rest of Europe	Ukraine
Copenhagen	0	West Europe	Denmark
Berlin	0	West Europe	Germany
Hamburg	1	West Europe	Germany
Miami	0	North America	United States
Geneva	1	West Europe	Italy
Dalian	1	Asian and Pacific	China
Montreal	1	North America	Canada
Qingdao	1	Asian and Pacific	China
Manila	1	Asian and Pacific	Philippines
Vancouver	1	North America	Canada
Dusseldorf	0	West Europe	Germany
Xiamen	1	Asian and Pacific	China

Ningbo	1	Asian and Pacific	China
Rotterdam	1	West Europe	Netherlands
San Juan	1	Latin America	Puerto Rico
Osaka	1	Asian and Pacific	Japan
Karachi	1	Asian and Pacific	Pakistan
Yokohama	1	Asian and Pacific	Japan
Valencia	1	West Europe	Spain
Alexandria	1	Africa	Egypt
Fuzhou	1	Asian and Pacific	China
Nagoya	1	Asian and Pacific	Japan
Southampton	1	West Europe	UK
Durban	1	Africa	South Africa
Yantai	1	Asian and Pacific	China
Kobe	1	Asian and Pacific	Japan
Incheon	1	Asian and Pacific	South Korea
Kingston	1	Latin America	Jamaica
Guayaquil	1	Latin America	Ecuador
Atlanta (Ga)	0	North America	United States
Boston (Ma)	0	North America	United States
Dallas (Tx)	0	North America	United States
Bremen	1	West Europe	Germany
Houston (Tx)	1	North America	United States
Long Beach (Ca)	1	North America	United States
Los Angeles (Ca)	1	North America	United States
Oakland (Ca)	1	North America	United States
San Francisco (Ca)	0	North America	United States
Seattle (Wa)	1	North America	United States
Sofia	0	Rest of Europe	Bulgaria
St. Petersburg	1	Rest of Europe	Russia
Washington, Dc	0	North America	United States
Ho Chi Minh City	1	Asian and Pacific	Vietnam

ANNEX 2: Regression model of port city

Model Summary[j]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.699[a]	.489	.478	.43890	
2	.876[b]	.767	.756	.29993	
3	.888[c]	.788	.774	.28905	
4	.902[d]	.814	.797	.27410	
5	.911[e]	.830	.811	.26444	
6	.919[f]	.844	.822	.25635	
7	.927[g]	.860	.836	.24612	
8	.933[h]	.870	.844	.24016	
9	.937[i]	.879	.851	.23482	1.799

ANOVA[j]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.672	1	8.672	45.020	.000[a]
	Residual	9.054	47	.193		
	Total	17.726	48			
2	Regression	13.588	2	6.794	75.521	.000[b]
	Residual	4.138	46	.090		
	Total	17.726	48			
3	Regression	13.966	3	4.655	55.718	.000[c]
	Residual	3.760	45	.084		
	Total	17.726	48			
4	Regression	14.420	4	3.605	47.986	.000[d]
	Residual	3.306	44	.075		
	Total	17.726	48			
5	Regression	14.719	5	2.944	42.098	.000[e]
	Residual	3.007	43	.070		
	Total	17.726	48			
6	Regression	14.966	6	2.494	37.956	.000[f]
	Residual	2.760	42	.066		
	Total	17.726	48			
7	Regression	15.242	7	2.177	35.948	.000[g]
	Residual	2.484	41	.061		
	Total	17.726	48			

8	Regression	15.419	8	1.927	33.416	.000[h]
	Residual	2.307	40	.058		
	Total	17.726	48			
9	Regression	15.575	9	1.731	31.384	.000[i]
	Residual	2.151	39	.055		
	Total	17.726	48			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.654	.358		4.614	.000		
	log multinational enterprise	1.027	.153	.699	6.710	.000	1.000	1.000
2	(Constant)	1.346	.248		5.419	.000		
	log multinational enterprise	.982	.105	.669	9.372	.000	.997	1.003
	04 Real GDP growths (%)	6.237	.844	.527	7.392	.000	.997	1.003
3	(Constant)	.713	.382		1.868	.068		
	log multinational enterprise	.826	.125	.563	6.625	.000	.653	1.531
	04 Real GDP growths (%)	6.526	.824	.552	7.916	.000	.970	1.031
	log GDP	.210	.099	.181	2.128	.039	.649	1.541
4	(Constant)	1.282	.430		2.984	.005		
	log multinational enterprise	.775	.120	.528	6.450	.000	.633	1.579
	04 Real GDP growths (%)	5.334	.920	.451	5.799	.000	.700	1.428
	log GDP	.380	.116	.327	3.264	.002	.421	2.373
	log GDP per capita	-.275	.112	-.236	-2.459	.018	.459	2.177
5	(Constant)	.972	.441		2.204	.033		
	log multinational enterprise	.787	.116	.536	6.784	.000	.632	1.583
	04 Real GDP growths (%)	5.183	.890	.438	5.821	.000	.696	1.438
	log GDP	.398	.113	.343	3.539	.001	.419	2.388
	log GDP per capita	-.368	.117	-.317	-3.150	.003	.391	2.560
	log nEigenvec D	.473	.229	.146	2.067	.045	.794	1.260
6	(Constant)	1.034	.429		2.413	.020		
	log multinational enterprise	.760	.113	.518	6.708	.000	.622	1.607

	04 Real GDP growths (%)	5.400	.870	.457	6.204	.000	.684	1.462
	log GDP	.437	.111	.377	3.939	.000	.405	2.468
	log GDP per capita	-.355	.113	-.306	-3.132	.003	.389	2.569
	log nEigenvec D	.451	.222	.139	2.031	.049	.792	1.263
	Rail	-.244	.126	-.123	-1.938	.059	.925	1.081
7	(Constant)	.809	.425		1.905	.064		
	log multinational enterprise	.686	.114	.467	6.000	.000	.564	1.773
	04 Real GDP growths (%)	5.454	.836	.461	6.523	.000	.683	1.463
	log GDP	.391	.109	.337	3.601	.001	.389	2.568
	log GDP per capita	-.396	.111	-.340	-3.580	.001	.378	2.646
	log nEigenvec D	.438	.213	.135	2.054	.046	.791	1.264
	Rail	-.331	.128	-.167	-2.599	.013	.829	1.206
	I4 Inner Structure	1.134	.531	.170	2.137	.039	.538	1.860
8	(Constant)	1.111	.449		2.474	.018		
	log multinational enterprise	.658	.113	.448	5.834	.000	.553	1.810
	04 Real GDP growths (%)	5.014	.854	.424	5.873	.000	.624	1.602
	log GDP	.379	.106	.326	3.562	.001	.388	2.580
	log GDP per capita	-.458	.114	-.394	-4.031	.000	.341	2.931
	log nEigenvec D	.357	.213	.110	1.677	.101	.754	1.326
	Rail	-.377	.127	-.190	-2.967	.005	.794	1.260
	I4 Inner Structure	1.329	.530	.200	2.509	.016	.514	1.947
	log ship calling	.079	.045	.121	1.749	.088	.675	1.481
9	(Constant)	.950	.449		2.116	.041		
	log multinational enterprise	.622	.112	.423	5.542	.000	.533	1.877
	04 Real GDP growths (%)	5.090	.836	.430	6.089	.000	.622	1.607
	log GDP	.367	.104	.317	3.528	.001	.386	2.590
	log GDP per capita	-.503	.114	-.433	-4.405	.000	.322	3.106
	log nEigenvec D	.391	.209	.121	1.868	.069	.747	1.338
	Rail	-.334	.127	-.168	-2.629	.012	.761	1.314
	I4 Inner Structure	1.557	.535	.234	2.908	.006	.481	2.079
	log ship calling	.090	.045	.139	2.020	.050	.660	1.514
	Maximum Size Vessel	.132	.078	.108	1.685	.100	.760	1.316

a. Dependent Variable: log FDI value D

Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.0753	5.2480	4.0215	.56964	49
Residual	-.46968	.43791	.00000	.21167	49
Std. Predicted Value	-1.661	2.153	.000	1.000	49
Std. Residual	-2.000	1.865	.000	.901	49

a. Dependent Variable: log FDI value D

ANNEX 3: Regression model of all cities

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.609[a]	.371	.364	.41471
2	.814[b]	.662	.655	.30562
3	.826[c]	.682	.672	.29800
4	.837[d]	.701	.688	.29045
5	.848[e]	.718	.703	.28356

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.529	1	9.529	55.403	.000[a]
	Residual	16.167	94	.172		
	Total	25.695	95			
2	Regression	17.009	2	8.505	91.054	.000[b]
	Residual	8.686	93	.093		
	Total	25.695	95			
3	Regression	17.525	3	5.842	65.780	.000[c]
	Residual	8.170	92	.089		
	Total	25.695	95			
4	Regression	18.019	4	4.505	53.398	.000[d]
	Residual	7.677	91	.084		
	Total	25.695	95			
5	Regression	18.459	5	3.692	45.913	.000[e]
	Residual	7.237	90	.080		
	Total	25.695	95			

Coefficients[a]

Model		Unstandardized Coefficients	
		B	Std. Error
1	(Constant)	2.059	.285
	log multinational enterprise	.864	.116
2	(Constant)	1.355	.224
	log multinational enterprise	1.003	.087
	04 Real GDP growths (%)	5.993	.670
3	(Constant)	1.640	.248
	log multinational enterprise	1.070	.089
	04 Real GDP growths (%)	4.573	.879
	log GDP per KM	-.196	.081
4	(Constant)	1.205	.302
	log multinational enterprise	.971	.096
	04 Real GDP growths (%)	4.279	.866
	log GDP per KM	-.261	.084
	log GDP	.177	.073
5	(Constant)	1.303	.297
	log multinational enterprise	.856	.106
	04 Real GDP growths (%)	4.532	.852
	log GDP per KM	-.255	.082
	log GDP	.228	.075
	Port or not	-.155	.066

Coefficients[a]

Model		Standardized Coefficients	t	Sig.
		Beta		
1	(Constant)		7.235	.000
	log multinational enterprise	.609	7.443	.000
2	(Constant)		6.049	.000
	log multinational enterprise	.707	11.534	.000
	04 Real GDP growths (%)	.548	8.949	.000
3	(Constant)		6.602	.000
	log multinational enterprise	.754	11.987	.000
	04 Real GDP growths (%)	.418	5.202	.000
	log GDP per KM	-.204	-2.411	.018
4	(Constant)		3.996	.000
	log multinational enterprise	.684	10.076	.000
	04 Real GDP growths (%)	.391	4.943	.000
	log GDP per KM	-.270	-3.115	.002
	log GDP	.172	2.418	.018

5	(Constant)		4.380	.000
	log multinational enterprise	.603	8.077	.000
	04 Real GDP growths (%)	.415	5.319	.000
	log GDP per KM	-.264	-3.119	.002
	log GDP	.221	3.053	.003
	Port or not	-.150	-2.340	.022