JIAQI YANG

Towards the Restructuring and Co-ordination Mechanisms for the Architecture of Chinese Transport Logistics

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Richting een herstructurering van en coördinatie mechanismen voor het Chinese transportwezen

Thesis
to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus
Prof.dr. S.W.J. Lamberts
and in accordance with the decision of the Doctorate Board
The public defence shall be held on
Thursday 22nd January 2009 at 16:00 hrs

by
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born in Ezhou, P. R. China

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Erasmus Research Institute of Management – ERIM
Rotterdam School of Management (RSM)
Erasmus School of Economics (ESE)
Erasmus University Rotterdam
Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM PhD Series in Research in Management, 157
Reference number ERIM: EPS-2009-157-LIS
ISBN 978-90-5892-198-7

Design: B&T Ontwerp en advies www.b-en-t.nl
Print: Haveka www.haveka.nl

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Acknowledgements

After almost seven years of work and study, I eventually managed to finish this PhD thesis. Frankly, this part-time PhD study has been one of the most challenging parts in my career so far. Notwithstanding this, these years have been most rewarding. Actually, as an intellectual effort, a PhD study is a laborious process which could have never been successfully completed without the help of a number of people.

First of all, I would like to express my deepest gratitude to Professor Haralambides, my supervisor, for his supervision and guidance throughout the whole process of writing this thesis. I especially appreciate his patience on my slow progress at the early stages. His critical advice and views on various drafts of this thesis have been of great value and have helped me in the completion of the study. Without his consistent instruction and encouragement, this thesis could not have reached its present form.

Also, I would like to express my profound and heartfelt gratitude to the China-Holland Education & Research Center (CHERC) for funding and for providing facilities and home-like "logistics" services during my study at Erasmus University Rotterdam (EUR). I owe special thanks to Mrs. Weichia Tseng, General Director of CHERC, who has provided me help and encouragement in the whole period of my PhD study. Thanks are also due to Professor Lammerts van Bueren, Honorary Chairman of CHERC, who first gave me the chance to study in the CHERC Masterclass.

I would like to express my sincere thanks to Professor Xinping Yan, Vice President of Wuhan University of Technology (WUT) and Professor Weiguo Wu, Dean of the School of Transportation of WUT. Without your strong support, I could not have had the opportunity to stay in Holland to write my PhD thesis.

The Ministry of Communications (MOC), P. R. China, has financially supported a R&D project, related to this PhD, which I led. I would wish to express my appreciation for the valuable input of the partners in this project from which this thesis has benefited. I especially express my thanks to MOC and the local transport departments of Hubei province and other provinces for providing the data and suggestions. Additionally, I would like to express my thanks to my colleagues in the Department of Transportation Management, School of Transportation, of WUT for their comments and recommendations, as well as help in the previous research of this thesis. Special thanks are due to Professors Fu Xinping, Qin Liu, and Ms. Zhe Zhou for their helpful and constructive comments on the previous research of this thesis.

Part of this research also benefited from an Asia-Link project with Antwerp University, Belgium. I express my grateful thanks to Professors Eddy Van de Voorde, Dr. Tom Pauwels and Dr. Thierry Vanelslander of the University of Antwerp (Faculty of Applied Economics) for their comments, recommendations and help.

Staying with my Chinese friend at EUR was a great opportunity. I would like to appreciate my friends, Anping, Wenzhong, Weisheng, Weiwei, and Sufan who made my life a fun happening without loneliness during my staying in Rotterdam. In addition, I wish to thank Dr. Miaojia Liu of MEL for her assistance in the preparation of my PhD thesis defence.

Last, I would like to express my deepest appreciation and thanks especially to my parents, wife and daughter for their loving consideration and great confidence in me throughout these years. Your understanding and persistence in helping me reach my goal were a great encouragement when facing difficult times during the writing of the thesis.

Jiaqi Yang

Rotterdam, December 2008

Chapter 1 Introduction

1.1 The objectives and meaning of this research

Globalization of economic activities, including trading, sourcing, manufacturing, and marketing, has resulted in the need for strategic and efficient worldwide logistics networks. The worldwide logistics networks, which focus on integrating product sourcing, production, and distribution, can deliver an efficient and high-quality response to demand from any segment of the world market (OECD, 2002).

Essentially, logistics is an optimization process of all activities to ensure the delivery of cargo through a transport chain from the point of origin to the final consumer. In this context, the trend towards global logistics, particularly in more developed transport networks, has been reshaping transport activities and giving an impetus to the growth of freight transport.

Meeting the need for integrated global logistics has led to the development of a considerable market for logistics services, not only in traditional industrialized countries, but also in prosperous developing economies such as China. With the globalization of manufacturing and trading, the new outsourcing trend for manufacturers, i.e. to look for global logistics packages rather than just straightforward transport or forwarding, has opened new windows of opportunity for transport companies and encouraged many transport companies to transform themselves into intermodal logistics organizations (Notteboom, 2001).

In recent years, the importance of logistics in propelling the development of the Chinese national economy has become increasingly noticeable. As such, the dependence of the Chinese economy, which is developing at top speed, on logistics is also increasing steadily. This momentum means great opportunity for the growth of the Chinese transport industry. Consequently, the development of logistics has been brought to the attention of not only transport companies, but also administrative agencies of the transport industry in China (Logistics & Material Handling, 2002).

Within the changing context of compliance with shippers' logistics requirements, the major Chinese groups operating in freight transport and shipping services, such as COSCO, China Shipping, and Sino-trans, have shown signs of great activity; while continuing to focus mainly on freight transport and shipping, they have shifted their attention from a port-to-port approach to that of door-to-door and even "shelf-to-shelf" so as to provide services that better meet the needs of customers. In addition to transport services, they have also implemented strategic choices to engage in warehousing, distribution, and other outsourcing activities that aim to achieve control of the whole supply chain. In this continuously evolving scenario, the approach of Chinese transport companies to logistics should be analyzed properly, taking into

account that, with China's entrance into the World Trade Organization (WTO), the most significant foreign logistics and transport/shipping companies (i.e., UPS, TNT, FedEx, Maersk and NYK) are and/or have been infiltrating into the Chinese logistics market by setting up joint ventures or acquisitions to achieve competitive positions in Chinese logistics and transport services. To gain competitive advantage in such a dynamic market environment, the Chinese transport industry is restructuring its services through incorporating logistics thinking and concepts into transportation services and management operations, for example, "one-stop shopping" concept implemented by COSCO.

In the meantime, the booming demand for transport logistics services has also led government agencies to systematically examine the situation, barriers, and counter-strategies in Chinese logistics development. Logistics provides opportunities to expand intermodal freight transport by volume and distance of goods flows and by taking advantage of better planning and co-ordination possibilities offered through information and communication technologies (ICT) (OECD, 2002). Therefore, logistics could contribute to the development of Chinese economy by improving the level of service offered by intermodal transport to make it more attractive to shippers. However, this will require co-ordinated governmental interventions, including harmonized regulations, and the standardization frameworks for the use of technologies and infrastructures. In other words, appropriate government intervention will play a significant role in the healthy development of logistics, especially in the emerging logistics market of China.

For this purpose, a significant directive entitled "Advisory opinions on ways to speed up the development of China's logistics" was introduced on March 2, 2001, by six ministries in China. These ministries have total responsibility for the administration of transport and logistics and comprise the State Economic and Foreign Trade Commission (SEFTC); the Ministry of Railways (MOR); the Ministry of Communications (MOC1); the Ministry of Information Technology (MOIT); the Civil Aviation Administration of China (CAAC); and the Ministry of Foreign Trade and Economic Cooperation (MOFTEC), which has merged with SEFTC to form the Ministry of Commerce (MOC2).

According to the government's policy guidelines (SEFTC, 2002) which outline the objectives and guiding principles for developing Chinese logistics, the core guiding principle for Chinese logistics development is to enable Chinese businesses and products to be internationally competitive. In order to achieve this goal, China will take feasible measures to encourage businesses, deepen their understanding of logistics and provide a competitive, high-quality integrated logistics service. Based on this guiding principle, China aims to achieve the following overall objectives of logistics development:

- ✧ Adopt advanced logistics management techniques, ICT, and equipment;
- ✧ Speed up the pace to establish a clear, timely, efficient logistics network covering the various levels of nationwide distribution channel as well as regional, urban, and enterprises; and
- ✧ Devote major efforts to foster commercialized and specialized logistics market and services in light of international practice and the laws of market economy to satisfy the

demand of customers.

In addition, the directive suggests that various types of logistics providers, including transportation companies, warehouse and distribution operators, forwarders, and multimodal transport operators, provide efficient, tailor-made, high-quality logistics services by taking advantage of their own comparative advantages. Meanwhile, as the major administrative agency of transport logistics, MOC1 (SEFTC, 2002) also issued a directive for Chinese transport companies to develop integrated logistics services in order to promote the transformation of traditional transport enterprises into logistics providers.

However, the impediments to the growth of Chinese transport logistics will enlarge the difficulty of logistical operations and integration for transport industry. The impeding factors present in the Chinese logistical environment are discussed below.

First, the mechanism that government regulates and controls the logistics market, while the market guides the operational behaviour of logistics enterprises, has not yet been established (He, 2001). On the one hand, government agency is short of necessary framework, as well as preparation and means for the macro management of transport logistics. On the other hand, logistical enterprises are deficient in substance to invest in logistics, evidenced by the lack of the same strategy existing in the planning and construction of logistics distribution centres, resulting in a basically disordered situation in the transport logistics market.

Second, from the perspective of the logistics infrastructure platform, the structure is currently by and large in an abnormal state. Generally, the logistics platform is a network, structured by transport lines and nodes. Over the past few years, the lines (highways, railways, etc.) that the construction achievements can be obviously seen through the expansion of length have always been brought to the attention of government institutes, which explains the rapid increase in the length of transport lines. However, the intersecting nodal points (stations, depots, etc.) of transport lines, which are hard to quantify, have been ignored for a long period. In particular, the integrated intersections (hubs) for different types of transport lines such as railways, waterways, airways, highways, etc., have not yet been given the deserved attention.

The third impeding factor comes from the macro administration regime. Affected by the planning economy regime, the various functions of logistics are divided into different administration departments. Since the implementation of the “reform and opening up” policy in China, each sector related to transport logistics has made rapid progress. However, from a perspective of systematization, the amount of progress is uneven, with no optimum effect overall. For instance, the planning of highways, railways, waterways, air, warehouses, freight stations, ports and depots—even logistics centres—is on the whole drafted by separate departments, regions, and institutes, creating a lack of comprehensive, integrated, and unified consideration for the planning.

The fourth impediment markedly occurs at the macro economic level—i.e., the regulatory environment of industry. As mentioned above, quite often more than one ministry has

responsibility for a business sector, and each can have a different perspective on its development and regulatory reform program. In the transport/freight sector, for instance, both MOC1 and MOC2 are involved in regulating and setting policies in areas such as logistics, shipping, trucking, and warehousing/distribution (Drewry, 2003). The regulations, which are formed in the shade of segmented departments and regions—even with the colour of local protectionism—result in the lack of unified competition rules for the players. This seems to make unfair competition unavoidable. Meanwhile the logistics regulations concerning industrial policy and planning have to be further improved.

In light of such a situation, it is imperative that China restructures its architecture for its transport industry by incorporating logistics thinking and embodying the strategic objective of Chinese logistics development. The aim of architecture restructuring is to establish and improve the mechanism of integrated logistics operations and planning as well as the construction of transport logistics infrastructure and facilities. By using the experience of developed economies as a reference and by integrating its own conditions and situation, China must strengthen the co-ordination and harmonization among the components and nodes of its logistics system. This should be helpful for speeding up the establishment of an efficient logistics network in order to satisfy the increasing demand for value-added logistics services.

The architecture of transport logistics (ATL) is an integrated and coordinated system that combines the principles (logistics enterprise, government agency), circumstances, and operation mechanism. The main function of the system is to accelerate the essential interaction and coordination among transport logistics enterprises, government agencies, and relevant institutions at national level. Accordingly, constructing the system will benefit the optimal allocation and comprehensive utilization of transport logistics resources.

This research aims to form a framework for the establishment of ATL with appropriate structure, complete functions, and efficient operations, focusing on the macro environment and supporting system as well as on cultivating the mechanism and monitoring model and the technique strategy of Chinese transport logistics. In this context, the objectives of this research cover two levels of logistics management. At the macro level, the research intends to provide theoretical support and policy guidelines for the government agency to effectively exercise the function of macro adjustment and supervision of the transport logistics market. At the micro (firm) level, the research attempts to offer advisory recommendations for Chinese transport logistics enterprises to provide value-added logistics services to satisfy customers based on market mechanisms.

1.2 The definition of research scope

Logistics itself shows compound characteristics because it involves various sectors and activities, such as transportation, warehousing, trading, customs, and banking. Transportation is a key component and activity in the logistics value chain as it moves products through various stages of production and ultimately to consumers (Luo, 2000). For this reason, the scope of this research is confined to the transport sector, although the links and harmonization

with other logistical sectors will be taken into account in order to achieve the efficient operation of an integrated logistics system. In this context, the research aims to outline a framework for the architecture of transportation from a logistics perspective in China. This is achieved by the following chapters.

Chapter Two goes to the fundamental probing into the structure and components of the architecture in light of a literature review of transport logistics worldwide and in China. Accordingly, the gradational and structural relationships between the components are simultaneously examined in this chapter. As the aim of this research is to define the constitution of the architecture of Chinese transport logistics (ACTL) conforming to the reality and environment of Chinese transport logistics, Chapter Three systematically analyzes the current situation of structure and components of the architecture. This is achieved by reviewing the state-of-the-art of Chinese transport logistics market structures, which mainly include the growth of Chinese transport logistics, the characteristics of supply and demand, and the market competitiveness based typically on on-the-spot investigation, questionnaires, and expert advices.

The subsequent four chapters contribute to the restructuring and better co-ordination of mechanisms for the architecture of Chinese transport logistics (ACTL).

With globalization and the increasing need for competitiveness, the ability of countries to improve the logistical quality and reduce transaction costs through the provision of adequate and efficient intermodal transport systems is more critical than ever. Intermodalism is at the core of most advanced logistics strategies used by the major transport companies in the world (OECD, 2001). According to European Parliament (2007), intermodal transport is defined as "a transport system whereby at least two different modes are used in an integrated manner in order to complete a door-to-door transport sequence". In this context, a priority is to integrate the more environmentally-friendly modes of transport – rail, inland waterway transport and short sea shipping – into the transport chain more effectively (European Parliament, 2007). With China's emergence as a global manufacturing centre, reshaping China's logistics channel that is getting more global, is imperative. In order to meet international demand for integrated logistics services, China needs to restructure its transport system through encouraging a modal shift from less sustainable modes of transport—particularly road transport—to environmentally friendly modes, such as rail and water (coastal and inland waterways) transport while maintaining logistical quality and economic growth. To this end, Chapter Four discusses the issue of building a new era of sustainable transport logistics chain in China. Based on the EU initiative of decoupling transport growth significantly from economic growth in order to reduce congestion and other negative side effects of transport, this chapter aims to examine whether this initiative is meaningful and feasible in the context of freight transport in China as well as explore a strategy for encouraging a modal shift from less sustainable modes of transport to environmentally friendly modes. In this respect, this chapter assesses the relationship between freight transport and economic activities in China and examines the possible factors affecting the relationship between the transport demand and the development of the Chinese economy. Furthermore, this chapter discusses the need for an

appropriate government intervention and policy instruments in order to build a sustainable transport logistics chain in China.

Making appropriate policy decisions to improve the quality of more environmentally friendly modes such as rail and water transport that compete with road haulage is an urgent need for true intermodality (Meersman *et al*, 2003). For the Chinese shipping sector, which is not yet perfectly integrated into the nationwide transport logistics network, a policy on maritime safety and a policy aimed at the reflagging of ships to China's registers will promote the integration of the shipping sector into a "one-stop shop" logistics chain, as shipping is the predominant mode of transport for international trade; indeed, over 90 percent of China's foreign trade is carried by sea. In this respect, finding an optimal policy alternative is extremely important for maximizing the average performance level of a transport logistics system. To this end, Chapter Five seeks to model policy intervention based on a case study of reversing flagging out in the Chinese shipping sector.

As the principal players in a logistics chain, qualified transport logistics service providers that are able to provide high-level integrated logistics services, are of great importance for China to expand its transport logistics industry in order to meet the need for value-added logistics services of both national economy at the macro level and customers/shippers at micro level. Just as the transport logistics industry itself, Chinese transport logistics enterprise is still in its infancy compared to its international counterpart. To this end, an effective cultivating mechanism that will provide a way to foster and nurture leading logistics providers with the best practices should be set up in order to promote the growth of Chinese transport logistics enterprises and industry. By adopting various effective approaches, the cultivating mechanism will be formed and increasingly perfected, thereby speeding up the transition and promotion of Chinese transport logistics enterprises. In this context, Chapter Six examines the evolving role and position of Chinese transport logistics service providers in a logistics chain from the perspective of shipping lines and it attempts to restructure their operating model based on best practice experiences of foreign logistics companies.

In order to establish an effective and dynamic market mechanism for Chinese transport logistics, Chapter Seven focuses on the administrative model for Chinese transport logistics and the co-ordination mechanisms among government, institutes, and enterprises. Compared to the traditional freight transport market, the transport logistics market of China is still in its initial stages. It is of great importance in such an immature market to establish an effective market information guiding system to put it on the right track in its initial development. For the purpose of achieving an effective information guiding mechanism between the market and the principal of macro regulation and control (government), it is necessary to structure an information monitoring and guiding (IMG) model for the Chinese transport logistics market. Since the 1970's some market economy countries, such as the USA, France and Japan, have successively established monitoring and early warning systems of economic prosperity. Periodically published economic prosperity indices (EPI) have become one of the most efficient tools in monitoring the running of these economies and of simplifying resource allocation decision-making processes (Zhang *et al*, 2001). In the international shipping market,

freight indices have long been used to indicate fluctuations in freight rates and prosperity. Among them, the Baltic Freight Index (BFI) is the most widely used market indicator in dry bulk shipping (Stopford, 1997). In recent years, the EPI is also increasingly being used in China along with the growth of Chinese market economy. EPI has become one of the bases and tools of policy formulation and decision-making for Chinese governmental agencies and industrial enterprises (Yang *et al,* 2007). In the Chinese shipping market, the China Containerized Freight Index (CCFI), which is calculated each week as the weighted average of actual rates on the eleven routes, is periodically published by Shanghai Shipping Exchange to reflect the trend of the Chinese container shipping market. Even for Chinese rail transport, which still bears the imprint of planned-economy, a monitoring and early warning system has been designed to indicate developments in the rail transport market (Zhang *et al*, 2001). In this context, this chapter, based on early warning theory and practice, seeks to inquire into building a favourable policy environment and more friendly regulations for transport logistics as well as the establishment of an evaluation system and information monitoring and guiding (IMG) model, including the theoretical foundation for the establishment of IMG; the organization and operation mechanism of IMG; and the prosperity index models of IMG and the applications of the models.

Finally, the conclusions of this research and the implications of the theory for management, and policy makers of Chinese transport logistics are presented. Limitations of the study, together with suggestions for further research are given in the last Chapter.

1.3 The process and methodology of research

In essence, the defined ATL in this research must conform to Chinese realities based on the exploration of gradational and structural relationships between the components of architecture of Chinese transport logistics. Consequently, the research has to firstly investigate the *status quo* and problems faced by Chinese transport logistics. The approaches to the investigation include typical on-the-spot investigations, questionnaires, expert advice, relevant observations, and a literature review.

For the purpose of surveying the situation of logistics services provided by Chinese transport firms, a questionnaire was developed in this research (for details see Annex 1). The questionnaire is divided into four sections. The first section requires the respondent company to clarify the knowledge about logistics from the point of view of the respondent company. The second section focuses on the respondent company's profile and background. The third section focuses on the transport logistics operations of the respondent company, which include the transport logistics information system, the capability of providing value-added services, service attributes, utilization of facilities and equipment, marketing models and pricing policy, promotion methods, etc. The last section focuses on government actions and policy recommendations that may help minimize the transport logistics problems faced.

Through on-the-spot interviews and posting, emailing, and faxing the questionnaire, a nationwide survey was conducted from March to May 2003. The responding accompanies

were distributed mainly in more than ten provinces or municipalities of China—Shanghai, Beijing, Guangdong, Zhejiang, Fujian, Chongqing, Hubei, Shandong, Jiangsu, Shanxi, and Henan—throughout the eastern, central, and western parts of the country. Nonetheless, the eastern part is the key area to be investigated due to its active market.

Meanwhile, the construction of the architecture should use the advanced experiences of foreign countries' transport logistics as a reference and incorporate the development characteristics of foreign counterparts. To this end, the practices of the development of transport logistics and the co-ordination mechanisms among government, institutes, and enterprises in foreign countries (especially in European countries) are discussed in this research.

In order to establish an effective and dynamic market mechanism for Chinese transport logistics, the research applies the early warning theory for the establishment of the IMG model. Combining the quantitative computation with qualitative analysis, the research explores the prosperity index models of IMG and their applications in the Chinese transport logistics market.

Figure 1-1 shows the process and methodology of this research.

Figure 1-1: The process and methodology of research

Chapter 2 The Fundamental Framework for the Architecture of Chinese Transport Logistics

The first section of this chapter is given to the literature review of transport logistics in China; in order to draw from the experiences of transport logistics in developed economies for restructuring China's transport logistics architecture, the worldwide evolution of logistics practices for transport industry are also reviewed. In the second section, the inherent linkage and characteristics of transport and logistics are discussed. Afterwards, section three focuses on the fundamental framework for ATL, which includes the components of ATL and the gradational and structural relationships among these components. Finally, the chapter defines the foundations for restructuring ATL in China.

2.1 Literature review of transport logistics in China and experiences from developed economies

2.1.1 Research on Chinese transport logistics

With the growth of the economy and demand for integrated logistics services, Chinese transport logistics have become increasingly noticed by international counterparts. More and more literature has contributed to the subject in the past decade, although most of the research has been undertaken from a perspective of firms' concerns.

In its report *China's Transport Infrastructure and Logistics*, Drewry (2003) believed that a combination of multinational companies selling more of their products in China and state-owned enterprises having to reorganize their operations to become more competitive is fuelling the need for value-added logistics services. However, China's 3PL industry is in its infancy, attracting just 1.5% of the country's total expenditure on logistics (transport services). This compares with an average of 10% in developed economies, although this is expected to grow over the next few years as logistics is at the 'centre stage' of the government's 10th five-year plan and is being backed by US$18 billion in investment. According to the Drewry's report, it can cost 50% more to transport goods inland in China than in Europe and/or North America, while the quality of service is poor. There is still a desperate need to reform legislative and customs procedures if the government's logistics strategy is to succeed. In addition, cross-border trucking restrictions are impeding traffic growth and require immediate attention. Standardization and support is also needed on the IT front (Drewry, 2003).

Shah (2002) examined the infrastructure and regulatory problems in the establishment of logistics networks in China. Based on a survey of multinational corporations (MNC) in China,

Shah concluded that it is extremely complicated to do business in China and it will remain so for a while. The logistics infrastructure is improving, but only in urban areas. Many informal distribution channels exist, including trading companies and other agents, and the involvement of many people in the transaction makes it difficult to manage goods from end to end. In addition, inconsistent government policies are a big part of the problem. One of the chief complaints of MNCs trying to do business in China is the number of contradictory restrictions imposed by local officials. Interpreting the rules and managing internal transportation within China are the most challenging tasks.

Jiang (2002) addressed issues of interest to firms wishing to establish their supply chains in China, providing a snapshot of current problems facing firms expanding operations in China and describing practical strategies for solving these problems. Jiang further provides a synopsis of lessons learned by firms currently operating in China and future trends in the country. Foreign firms face many supply chain-related difficulties, including China's overburdened and underdeveloped physical infrastructure; inexpert, underfunded state-owned distribution companies; an enormous, fragmented distribution and logistics sector; and regional protectionism. In addition, foreign firms face bureaucratic restrictions that prohibit them from legally importing, selling, and servicing products in a straightforward manner. In spite of these, companies are looking to strengthen their supply chains in China in an effort to leverage the country's cheap labour costs.

In their research on "Transportation in China in the 1990s", Speece and Kawahara (1995) examined the infrastructure developments and several problems facing rail use as well as road and water modes in the 1990s. Rail transport in China is slow and expensive, particularly for shipments to the interior, as rail lines and locomotives are old. However, it was noted that the Chinese government has been allocating a large budget for the construction and upgrading of the railway infrastructure. Such efforts may alleviate the railway problems. With regard to road transportation, which accounted for about one quarter of goods shipments in that period, the authors identified poor road conditions, lack of bridges, numerous roadblocks and checkpoints, and intensive construction activities around the large cities as factors contributing to the slow movement and the high cost of road transport. Other problems encountered included hijacking, highway robbery, and extortion. As transportation is under state control, the authors advised companies to pay more attention to government policies on transportation development (Luk, 1998) and integration as well as government enforcement efforts dealing with these policies.

Luk (1998) confirmed that the reform of Chinese distribution channel, as well as regime has introduced a new dynamism, radically reshaping the channel structure of the domestic market. These changes have been both structural in the sense of opening more channels at each level and operational in introducing profit incentives and encouraging entrepreneurial activity to provide more and better products and services to Chinese customers. Luk insisted that there is still a long way to go before China's distribution system becomes efficient. Many of the unresolved marketing and management problems are, by and large, caused by structural factors, such as inter-provincial and interministerial relationships, inefficient administration

procedures, and overlaps in the roles and functions of different administrative organizations.

Ding Keyi (2002), chairman of China Merchants Logistics Group—one of China's oldest commercial companies—spoke at the Warehouse of the Future conference, "Supply chain theory is not yet recognized or understood in China". "Most logistics is performed in-house, only between company facilities, with little connection between firms," Ding stated. He added that most shipments move by full truckloads and that they often are overloaded to unsafe levels. No network currently exists for shipping partial loads.

Jiang and Prater (2002) reviewed the evolution and future development of distribution and logistics in China. According to their study, beyond the geographic size and unbalanced development, the political/legal barriers are the most powerful forces that separate China's distribution market. Government interference in economic activities increases the risk to private investment and affects the extent of participation of private sector in the supply and distribution of goods. Legislation sets the allowed boundaries of distribution firms; although these limits can be determined at a national level, the biggest impact of political/legal barriers on distribution markets is regional protectionism. Provinces and municipalities have erected tariff and non-tariff barriers to keep out one another's products. Moving across provincial borders in China requires overcoming barriers. The current focus of logistics is provincial. However, Jiang and Prater argued that the accession of China to WTO has opened China's sales, service, and distribution sectors to direct foreign competition. Logistics services such as local and international courier services, freight forwarding, and distribution have also correspondingly been opened to foreign competition. The easing of restrictions on the transportation and logistics industry should make China a more attractive place for foreign companies. Competition should therefore bring large cost savings to Chinese consumers.

Based on the results of a survey of Singapore-based manufacturing firms that have operations in China, Ta *et al.* (2000) held that, in recent years, many foreign firms have flocked to China to take advantage of the opportunities in its large market. However, some of these firms have faced logistical problems in transporting and distributing their goods. The authors identify the transportation problems faced by foreign firms operating in China and examine the possible actions and factors for minimizing such problems. The survey results indicate that some transportation problems are more serious than others. The type of transport mode and ownership of the transport services used can affect the degree of satisfaction for the transportation of goods in China. The authors also identified the actions taken by firms that were most effective in alleviating transportation problems. The government can play an important role in improving the logistical environment, such as the transparency of rules and regulations governing the logistics industry.

Luo (2000) focused his research on cross-national logistics issues, such as the differences in logistics between China and developed countries and how these differences associate with the business environment. In his research of cross-national comparative logistics, he identified factors related to such differences by empirically comparing logistics both at the micro-level (firm) in logistics best practices and the macro-level (sector) in distribution, transportation,

and warehousing between developed and developing countries (e.g., China). He concluded that, in the developed world, like Europe and North America, logistics concepts and practices are basically understood and well-practiced, although some differences can still be found in practices due to historical, traditional, geographical, and demographical reasons. However, the differences in logistics between developed and developing countries are much larger in terms of logistics concepts and practices. This was evident when comparing logistics and the environment in China to that of the western developed countries (as shown in Table 2-1).

Table 2-1: Differences in Logistics Concepts and Practices between China and Western Countries

Items to compare		China (in transition)	Western Developed Countries
Concepts		Both the government and market forces are at work depending on the degree of the reform in companies and sectors	From micro level, principle of efficiency and effectiveness for competing in the market
Thoughts		Both equality and efficiency/effectiveness, depending on the degree of the reform	Efficiency and effectiveness, as a tool to gain competitive edges
Practices at sub-areas	*Distribution*	Both practice in planned and market economy co-exist, depending on the degree of reform	Horizontal; Competing in market; Supply chain coordination; Private ownership
	Transportation	Decentralized, depending on the modes of transport; Competing in Both market and planned economy; Multiple ownership	Decentralized (except for railway); Competing in the market; Private ownership dominated
	Warehousing	Decentralized; Market still not in order; Lack of service orientation	Decentralized; Competing in the market; Private ownership dominated
Practices (micro)		Less developed in terms of logistics best practice	Logistics best practice is basically the same in western developed countries

Source: Luo (2000).

2.1.2 Worldwide evolution of logistics practices in the transport industry

With regard to the implication of logistics for the transport industry, the academic literature has emphasized the impact of the changing logistics on the transport industry and the role of freight transport in customers' logistics chain management over the past few years. Evangelista *et al*. (1999) explored how shipping lines respond to the changing environment by using alliances in order to achieve objectives of internal efficiency and meet user logistical needs specifically in supplying higher service frequency and broader geographical coverage. They found that most of the alliances examined were concentrated in the maritime transport

phase rather than in inland transport and logistics services activities.

By using factor analysis and principal analysis to assess the degree of importance of a large number of service attributes, such as availability of cargo space, prompt response to shipper's complaints, on-time pick-up, and ability to provide just-in-time services if required by shipper, as well as a small number of underlying dimensions called strategic factors, Lu (1999) examined logistics services and strategic dimensions in Taiwanese maritime firms. The study revealed that the most important strategic dimension (factor) was value-added service, followed by promotion, equipment, and facilities as well as speed and reliability.

In light of the major changes under way affecting the shipping industry, Evangelista *et al*. (2000) outlined the role of (Italian) shipping firms in the logistics service market. In the context of demand features of general cargoes, known for high fragmentation, broad regional dispersion, and scarce stability in time, which has favoured the growth of road transport, the analysis showed that, in addition to the skills required to integrate itself within the logistics chain of customers, the shipping firm must tackle complex internal logistics problems to ensure continuity of freight flows, a dimensional level compatible with achieving economies of scale, and an acceptable level of concentration.

Based on the above review, the current trends in logistics strategies among transport companies can be categorized as follows.

Alliances

Deregulation and privatization of port and transport, which for some countries has contributed to removing one of the greatest constraints to the development of shipping into integrated transport and logistics, have triggered a radical restructuring process in the transport sector—especially in shipping, which is shifting the traditional boundaries and competitive order (Evangelista *et al*., 2000). Meanwhile, the rise of the concept of outsourcing and wide-scale adoption of the supply chain view have resulted in changes in relationships between transportation providers and other participants in the supply chain in the directions of the diffusion of alliances, partnerships, mergers, acquisitions, and the development of new types of third-party providers.

Two main approaches of alliance in liner shipping can be distinguished (Evangelista *et al*., 1999). The first covers only the maritime-port phase, while the second one tends towards inter-modality (agreements with road and/or rail transport firms and, less commonly, with airlines), leading shipping lines to integrate along the whole transport chain—namely, the three main constituent parts of sea transport, transhipment, and hinterland transport. In the first case, such alliances (agreements) chiefly aim to optimize internal capacity and reduce service production costs by achieving significant economies of scale. In the second case, the agreements with ports and other transport service suppliers allow shipping lines to achieve significant advantages in terms of service differentiation (Graham, 1998) and simultaneously represent a condition for achieving economies of scale in the shipping phase. Traditionally, co-operation in the shipping sector had the chief objective of maintaining freight rates at such

a level as to guarantee investment profitability. However, the recent trend in alliances involving shipping lines is characterized by sharing an increasing number of activities, achieving faster market expansion, and gaining access to supplementary expertise (Evangelista *et al*., 1999). In his study, Heaver (1996) showed that shipping lines were extending services beyond merely shipping to provide door-to-door services. He argued that shipping lines may achieve this objective by means of direct control or by developing alliances with local suppliers.

Third-Party Logistics (TPL)

To focus more attention on their core businesses and gain competitive advantages, shippers (manufacturers and retailers) may contract out their logistics activities—purchasing, material management, transport, distribution, storage, etc.—to third-party logistics (TPL or 3PL) if they can be performed more efficiently. As such, the TPL industry plays a significant and increasing role in providing logistics services in the economy. Those using TPL services reported positive impacts on logistics costs and system performance, customer satisfaction, and employee morale (McGinnis *et al*., 1995). The challenge that TPL providers face is to provide services that add more value to their customers' business than the customers would be able to achieve by themselves. Berglund (1999) stressed that the basic way for TPL providers to add value is to achieve operational efficiency at a higher level than others (notably the customer) would be able to, thereby providing a better performance/cost ratio. Also, TPL providers can add value by sharing resources among customers—for example, by running a warehouse for several customers or by operating joint transportation networks for a set of customers. Thus, the driver for value creation is predominantly economies of scale.

Studies have shown that the development of strategic alliances on the part of shipping lines appears to represent one of the strategic options to achieve the status of true TPL providers (Evangelista *et al*., 1999). Consequently, these firms may have engaged in alliances with other suppliers of transportation and logistical services operating in the supply chain to create vertically integrated logistics services, thereby greatly simplifying the shipper's decision to use an outsourced logistics solution. In their study, Evangelista *et al*. (1999) argued that, with regard to integrated management of the supply chain, one of the basic strategic options for shipping lines should be to evolve towards the function of TPL, or single first-level supplier of complete logistical and transport services required by industrial and commercial firms. This option seems to be within the reach of large shipping lines, who can form alliances with specialized suppliers operating both globally and locally and thus acquire the necessary logistical capabilities, while already integrated along the transport chain.

Value-added Logistics Service

Value-added logistics is the integration of industrial and logistical activities. It implies that the production and distribution parts of a supply chain become truly integrated into one. As such, a large part of the value creation in the supply chain is transferred to logistics service providers. According to Porter (1985), an important aspect of logistics strategy is the concept of the value chain, which segregates a firm into its strategically relevant activities with a view to understanding the behaviour of costs and the existing and potential sources of

differentiation. In this context, using a value-added service as a source of competitive advantage has often been found in logistics service providers' strategy (Lu, 1999). As a hedge against supply chain competition (Porter, 1985), carriers should increase co-operation and co-ordination with their counterparts in order to develop wide distribution networks that are able to offer modern, value-added. and customer-designed logistics services. Notteboom *et al.* (2001) argued that, following the early main involvement in container consolidation, the subsidiaries of shipping lines in the US, which had acted as a leader in the development of integrated systems, moved into additional value-added services such as local transport, customs clearance, and supply chain management services in the late 1980s.

Dedicated terminals and carrier involvement in inland transportation
The door-to-door service philosophy has transformed most transport companies into intermodal logistics organizations (Notteboom et al., 2001). Due to the increase in the significance of inland costs in the overall cost structure, improvements in terminal and inland operations are required not only to lower the cost burden of door-to-door transport, but also to ensure that the savings at sea with the post-panamax vessels are not to be lost on land. Nowadays, with the limitation of price competition, liner shipping has focused on the competition on quality of service, in which better coordination and integration with inland transport companies; ownership of terminals and equipment; and geographical coverage are considered to be major quality variables (Haralambides, 2007). Most likely, this explains why shipping lines are expanding their scope to include terminal operations and hinterland transportation. This is evident by the fact that the demand for dedicated terminals in Europe has increased considerably in the last couple of years, with new initiatives still underway.

2.2 Inherent linkages and characteristics of transport and logistics

To a certain extent, transportation is currently evolving into the stage of logistics after experiencing two periods of unimodal transport and multimodal transport, respectively. In the past decades, the development of logistics theory and practice has spurred the transformation and improvement of transportation.

Regardless of traditional physical distribution or modern IT-based supply chain management, transportation is a fundamental means for logistics service. In this context, a close relationship exists between logistics and transport, while they possess their own individual characteristics. The following features highlight the inherent linkages and characteristics of transportation and logistics.

Logistics is a revolutionary breakthrough in traditional transportation
The essence of logistics is the efficient and effective movement of goods, which is the exact fundamental function of transport. In this sense, logistics is actually an extension of the concept of transportation. However, we can say that logistics is a revolutionary breakthrough in traditional transport.

The breakthrough is first reflected by the integrating function of logistics, which makes the

segmented transport modes well organized into an integrated transport system. As such, the customer gains the benefit of efficient, timely, safe, cost-effective, and environmentally friendly "green" transport services.

Second, logistics breaks through the boundaries of transport sectors found along the production system. Today's transport chain is fully integrated within the production system. This is a concept under which the transportation/distribution activities are considered as a sub-system of the whole production system. It is now the integrated transportation chain that matters. From the buying of raw materials at the production site to the delivery of products to the receiver's warehouse, production, transportation, storage, distribution, and information are all integrated into one unique network. By incorporating into the concept of supply chain, transport logistics achieve the objective of reducing total cost and gain "win-win" benefits for supplier, manufacturer, distributor, logistics service provider, and customer.

Third, logistics breaks through the concept of a capacity-oriented transport service, emphasizing instead the purpose of customer-oriented service. Customer requirements determine service contents and procedures. With the tendency of a small lot of delivery and diversification of service, logistics service providers should offer specialized, tailor-made services to customers.

Finally, logistics pay more attention to process management and information flow in the various factors of transport. This makes the "black-box" operation in traditional transport more open and transparent. Therefore, it is helpful to adapt to the tempo of production and the sale planning of products.

Transportation is a core sector and function of logistics

Transportation is a component of the logistics system. To some extent it may be a core section in the process of goods movement. As previously stated, today's transport chain is fully integrated within the production system. As such, the improvements and development of the integrated transport system, distribution network, infrastructure, and facilities are becoming the foundation of society's logistics system and supply chain.

Transportation cost occupies the most important place in logistics costs

In order to improve profit and competitive advantage, businesses tend to reduce the total cost of logistics and supply chain. Statistically, transportation cost is currently the biggest item in logistics costs. For example, in the US, the transport expenses in 2002 accounted for 63 percent of total costs of logistics, as shown in Table 2-2. Meanwhile, for developed countries in Europe, transport costs accounted for one third of the total costs of logistics (Notteboom *et al.*, 2001). For this reason, transport rationalization is not only an important task for logistics organization, but also an effective approach for enhancing the efficiency and reducing supply chain costs for businesses.

Table 2-2: U.S. Business Logistics Costs, 2002

Components of Logistics Costs	Billions of Dollars	% of Total
Carrying Costs - $1.444 Trillion all business inventory	298	33
Interest	23	
Taxes, Obsolescence, Depreciation, Insurance	197	
Warehousing	78	
Transportation Costs	577	63
Motor Carriers:	462	
Truck - Intercity	300	
Truck - Local	162	
Other Carriers:	109	
Railroads	37	
Water	27	
Oil Pipelines	9	
Air	27	
Forwarders	9	
Shipper Related Costs	6	
Logistics Administration	35	4
Total Logistics Cost	910	100

Source: Federal Highway Administration, U.S. Department of Transportation, 2005

The greatest opportunity of transport firms is to become a principal part in the logistics market

The main functions of logistics include transport, warehousing and storage, handling, packaging and distribution. In this context, manufacturers, transporters, warehousing companies, trading firms, and even IT companies are all possible players in the logistics market. These parts take their own positions and play different roles in the process of logistics. Meanwhile, their logistics resources and conditions vary, creating discrepancies. Therefore, the difficulties in penetrating the logistics market that they face should not be the same. Transporters normally take transport and cargo handling as their key business. They usually own nationwide transport networks and cargo collecting systems. They also have a foundation in information systems and management. In particular, transport firms have accumulated a wealth of experience of operation management in transport logistics. All these positive factors make transport firms the most likely principal part in the logistics market. In the process of transforming into logistics businesses, transport firms will maintain their advantageous position and increasingly excavate their potentialities of logistical resources. TPL providers in the US are a prime example (as shown in Table 2-3); 60 percent of the top-40 TPL companies originated from transport firms in 2000.

Table 2-3: Largest 40 TPL Revenues Classified by TPL Origin in the US

Original or parent business	Percent of firms	Percent of Gross Logistics Revenue
Trucking	35	26
Rail	2.5	2
Leasing	7.5	14
Ocean Shipping	2.5	2
Air/courier/parcel	7.5	5
Warehousing	20	10
Forwarding, brokerage, shipping agent, customs	20	38
Shipper	5	2
Total	100%	100%

Source: Garland Chow, Spring 2002

Logistics is an inexorable trend of transport industry development

On the one hand, the development of logistics and supply chain management inexorably requires the transport industry to incorporate the logistics concept into transport operation and expand the extent and level of logistics services. On the other hand, logistics is an inexorable trend of the transport industry development. The market potentiality of logistics will offer an opportunity for the growth of transport. More and more transport firms have gradually realized that becoming involved in logistics services to provide shippers with a much higher level of service will bring about obvious benefits for themselves. In the mean time, this will strengthen the competitive edge in various aspects, which include:

- ✧ Seeking an optimum balance between service and cost by enhancing the consciousness of customer service;
- ✧ Extending the value-added space by enabling the possibility of controlling and managing transport logistics activities at higher level; and
- ✧ Avoiding fierce competition between transport logistics providers by building a trust-based partnership along the supply chain.

Transportation has different features from logistics

Although a close relationship exists between logistics and transport, they possess their own individual characteristics. Traditional transportation firms and freight forwarders are limited to one primary logistical process and simply execute decisions in these areas for the shipper. Moreover, transportation consultants assist in planning and controlling a specific logistics process, while logistics consultants help plan for logistics processes more strategically. Logistics service providers—who not only focus on the single logistics function, such as transportation or warehousing, but also provide a high degree of logistics management services—are one form of TPL. Examples include dedicated/contract transportation or dedicated/contract warehousing and value-added warehouse/distribution. The other type of TPL includes companies that provide a high degree of IT-based management services across multiple logistics processes according to the concept of logistics integration and long-term relationships. Names such as contract logistics, integrated logistics, fourth-party logistics,

third-party supply chain management, and lead logistics providers have been used to describe firms in this segment

2.3 The fundamental compositions of ATL and coordination mechanism for China's transport logistics industry

2.3.1 The fundamental composition of ATL

Normally, the architecture of transport (AT) is composed of the suppliers of transport services (transport firms, forwarders), the demanders of transport services (shippers, cargo owners), and the environment. Among these components, the environment includes the essential supporting conditions for achieving the interaction of supply and demand for transport. The environment conditions mainly include infrastructure (roads, terminals, depots, etc.), equipment and facilities (vehicles, information system, standardization, etc.), regulations, policies, and administrative regimes.

In light of the analysis of the inherent linkages and characteristics of transport and logistics, ATL should be established by means of merging the features of logistics into AT. This means that AT-based architecture must be suitable to the supply and demand of not only transport services, but also of the logistics function. For this, ATL needs to expand its scope and content of supplier, demander, and supporting environment conditions beyond those of AT. In particular, ATL has to establish a close linkage with customers' production systems, business processes, and other transaction activities normally independent of the AT system. Figure 2-1 shows the composition of AT and ATL.

In ATL, the construction of two fundamental platforms—infrastructure and information and communication technology (ICT)—are of great importance for the development of transport logistics. The infrastructure platform is formed by lines, such as railroad, highway, and waterway, and nodes such as logistics parks (base), logistics centres (distripark), ports (air, sea), terminals, freight stations, and depots. These platforms form the basis for supporting the movement, transfer, and temporary storage of goods.

The information and communication technology (ICT) platform is a public system to ensure the sharing of information and data along the transport logistics chain. Through a worldwide and nationwide communication web, the platform is docked with segmented business information systems in order to form a unified logistics management platform. In the process of logistics transactions, a tremendous amount of information and data is indispensably required. Consequently, the public platform is an essential means for efficiently facilitating the flow of information among industries, customers, and government agencies.

The construction of a public information and communication technology (ICT) platform is a fairly complex project, making it challenging for only one or a few enterprises to complete. Organization is a must to coordinate the various parts of logistics; this is obviously the task of the government. Based on the market mechanism together with its policy guiding and

regulatory functions, the government should play a key role in the construction of an information and communication technology (ICT) platform.

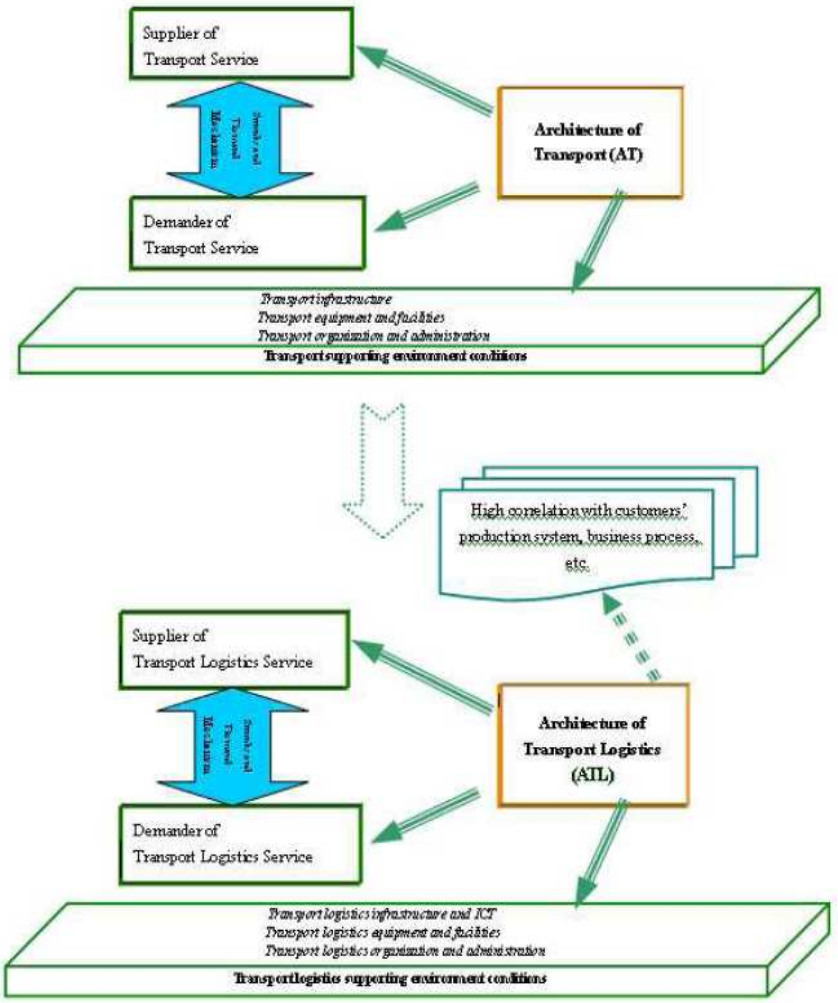

Figure 2-1: The topology of ATL

Source: Author

While constructing the fundamental logistics platform, the effective operating mechanisms of transport logistics should also be set up to ensure a smooth and healthy operation of transport logistics. These include a coordinating mechanism for government agencies and a cultivating

mechanism for transport logistics enterprises.

The administration of the various sections of logistics normally touches upon different agencies and institutions; in the case of China, these include MOC1, MOR, CAAC, MOC2, GAC, and GAB. As such, it is necessary to set up a sound coordination mechanism among the various government agencies and departments in order to avoid controversy or conflict in rules and policies issued by different departments. Currently, China's top priority task is to build a coordinated administration regime, instead of the current segmented system, to improve the supporting environment for the growth of transport logistics. At the same time, a series of rules and policies, adversary to transport logistics, should be improved and supplemented for the purpose of regulating the transport logistics operations. These rules and policies concern the following issues (the issue of establishing a coordination mechanism for China's transport logistics is discussed in detail in the next section).

Administration and supervision of the transport logistics market
In order to ensure a sound transport logistics market, an important role of the government is the supervision of market operations; safeguarding and regulating market order; and creating a sound market environment for the development of the industry. In this regard, an information monitoring and guiding (IMG) model is proposed and elaborated in Chapter Seven.

Market entry and withdrawal
To safeguard the transport logistics market order should strengthen registration and examination work and deter enterprises that fail to meet regulatory requirements from entering the market. These requirements and rules encompass market entry and withdrawal procedures. In this respect, China has issued a decree, entitled "*Regulations of the People's Republic of China on the administration of international maritime services*", aimed to regulate entry into China's seaborne trade market and the surveillance of fair competition (January 1st, 2002, MOC1). In this decree, market entry conditions and requirements of international seaborne trade and related supplementary business (such as international ship agents, ship management, cargo handling and storage, container depot and freight stations, etc.) are explicitly regulated. For instance, entry conditions include entrant's scale, qualified personnel, documentation and technical safety standards. An additional series of regulations on entry and withdrawal have entered into force since China's entrance to WTO in 2001. These regulations include the *Provisions of the People's Republic of China on Administration of the International Goods Shipping Agency Industry*, which was promulgated by the Ministry of Commerce (MOC2) in 2004; the *Measures of China for the Customs' Supervision over Inward and Outward Express Consignments*, which was promulgated by the Customs General Administration (CGA) in 2004; the *Provisions on Foreign Investment in Civil Aviation*, which was promulgated by the General Administration of Civil Aviation of China (CAAC) in 2002; and the *Implementing Rules of the Regulations of the People's Republic of China on International Maritime Transportation*, which was promulgated by MOC1 in 2003.

Standardization and normalization of transport logistics
Standardization and normalization are lifelines for the development of transport logistics. In the country's initiatives to improve transport logistics services, more attention should be given to standardization and normalization according to national policies, laws, and

regulations. In order to enhance enforcement strength and efficiency, it is the government's responsibility to authorize the national administration department of technology standardization to establish basic and uniform standards for infrastructure and facilities of transport logistics. Such standards and norms include those of measurement, techniques data transfer, and standards on the safety and environmental protection. Yet, in service industries, relatively few accepted or published benchmark parameters and targets exist that can be used by the typical service organization or manager, in both establishing an effective service strategy and in assessing and evaluating performance relative to industry standards and norms. Thus, for the administration, it is worth supporting and pressing industry associations to establish operation and service standards as well as unify logistics terminology and personnel licensing.

Transport logistics is a principal component of the logistics market. Without a certain amount of qualified firms that are able to provide high-level integrated logistics services, the transport logistics industry cannot expand. Just as transport logistics itself, Chinese transport logistics enterprises are still in their infancy compared to their international counterparts. To this end, an effective cultivating mechanism should be set up to promote the growth of transport logistics enterprises. In the case of China, foreign transport logistics companies, which have rich experiences in logistics best practices and advanced logistical management skills, should be introduced through partnerships, alliances, mergers, and acquisition. By adopting various approaches, the cultivating mechanism will be formed and increasingly perfected, thereby speeding up the transition and promotion of Chinese transport logistics enterprises.

Through the construction of transport logistics platforms and setting up of operation mechanisms, the ATL in China can be further optimized, as shown in Figure 2-2. This will result in the shaping of an interactive mechanism between the national and regional economy and transport logistics. As such, it lays a solid foundation and guarantees the realization of China's societal and economic objectives.

2.3.2 Coordination mechanism among various operating and managing initiatives for China's transport logistics

Inconsistency and lack of clarity exist in the definition of co-ordination, throughout the period during which co-ordination policy was fashionable (Van de Velde, 2005). Nevertheless, co-ordination is here defined as a pattern of decision making and communication among a set of actors who perform tasks to achieve goals (Romano, 2003). According to Romano (2003), a coordination mechanism consists of (1) the informational structure defining who obtains what information from the environment, how that information is processed and then distributed among different members participating in the mechanism itself, and (2) the decision-making process helping to select the appropriate action that need to be performed from the set of alternative solutions.

A number of characteristics of the functioning of transport (logistics) market (such as excessive competition, market failure, social issues) have led, through time, to a call for "coordination" (Van de Velde, 2005). As to transport logistics processes, which usually refers to materials information and financial flows (Romano, 2003), co-ordination was originally defined as an avoidance of inefficiencies, such as overlapping or duplication of infrastructure and services that would ultimately cause a financial burden for society. The challenge of

coordination in transport (logistics) processes is to ensure a division of tasks between transport modes according to their inherent advantages, and under prices reflecting the social costs of the provision of the services (Van de Velde, 2005).

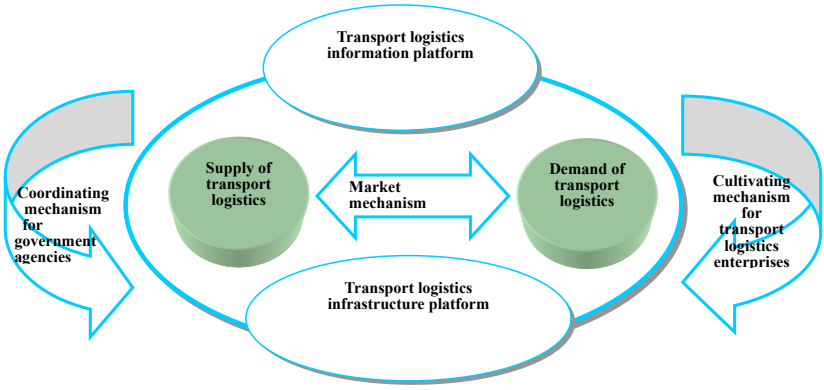

Figure 2-2: The construction system of ATL

Source: Author

As mentioned above, the current structure of transport logistics management in China is organized separately according to different transport modes and logistics sectors. Each transport logistics sector works according to its own policies and operational strategies, it allocates projects and builds its own network of relationships across other government departments. For instance, road and water transport are administered by the Ministry of Communications (MOC1); railroads fall under the authority of the Ministry of Railways; civil aviation is administered by the General Administration of Civil Aviation of China; oil and gas pipelines are managed mainly by PetroChina and Sinopec; freight forwarding is administered by the Ministry of Commerce (MOC2); urban transport falls under the authority of the local Construction Management Commission, with the State Development and Reform Commission, Ministry of Construction, and the Ministry of Public Security simultaneously involved in corresponding elements of transport administration. Additionally, transport logistics management also involves several other departments such as the General Administration of Customs (GAC), the Ministry of Finance, the Bureau of Land Resources, the State Forestry Administration and the State Environment Protection Administration. Generally speaking, the transport logistics system in China lacks comprehensiveness, while an integrated transport logistics management administrative system is still inchoate (Eco-Logica, 2006). Actually, transport logistics management in Europe, USA, and Japan is also decentralized. However, the coordination mechanisms in different ministries of these countries are well-established, thus providing better integration of transport logistics chains (Wang & Feng, 2002). In this regard, a coordination mechanism among various operating and managing initiatives should be established in China, in order to improve the consistency and coordination in development strategies, development planning, and industrial policies, and financial management of different transport modes and logistics sectors.

The establishment of coordination mechanisms is beneficial for Chinese transport logistics industry in promoting partnerships, complementarities, and synergies. This can be achieved through a well-coordinated planning of the nationwide layout of transport logistics infrastructure and facilities; sharing of information on existing initiatives, opportunities, and needs; exchange of resource materials and reports; facilitation of interaction and dialogue; and the fostering of ongoing collaboration and networking.

Moreover, implementation of a coordination mechanism needs active participation and support from transport logistics enterprises, government agencies, and relevant organizations. To this end, establishing regular meetings or a forum of relevant departments (ministers) of transport logistics sectors. Such an arrangement exists in Europe, where the Organization for Economic Cooperation and Development (OECD) and some member States act as the secretariat. This could further assist China in its efforts to integrate and coordinate transport logistics. Actually, China is taking action to establish a coordination mechanism in the logistics industry. While the directive "*Advisory opinions on ways to speed up the development of China's logistics*" was introduced by six ministries in 2001, the other directive "*Advisory opinions on the facilitation of China's logistics development*" was jointly announced by nine ministries in 2004. In this announcement, an inter-ministerial meeting system is adopted to enhance the coordination between the related government agencies and industry associations. To exert the function of the inter-ministry joint meeting in achieving integration among different parts of logistics chain, thirteen government departments and two transport logistics associations were required as members, including the Ministry of Communications (MOC1), the Ministry of Railways, the General Administration of Civil Aviation of China (CAAC), the Ministry of Commerce (MOC2), the State Development and Reform Commission, the Ministry of Public Security, the General Administration of Customs (GAC), the Ministry of Finance, the Bureau of Taxes Affairs, the State Commission of Standardization and the Ministry of Information Technology, China Federation of Logistics & Purchasing, and China Association of Transportation etc. (China Federation of Logistics & Purchasing (CFLP), 2004). The first inter-ministry joint meeting was held in May, 2005 to discuss the implementation of the coordination initiative in China (CFLP, 2006).

2.4 The gradational relationship between ATL components

According to the analysis of linkages and structure, a gradational relationship exists among the components of ATL. As shown in Figure 2-3, ATL includes three gradations. The basic gradation is the market system, composed of suppliers and demanders of transport logistics services. The second gradation is the platform (hardware) system, which includes the transport logistics infrastructure and the information system. The third gradation is the environment (software) system. The gradation covers the administration regime, policy and regulatory system, and cultivation of transport logistics enterprises.

The three gradations indicate an inclusive relationship between the components of ATL. They

are successively in the micro, mezzo and macro levels. Among them, the market system of transport logistics services is located in the micro level, the hardware platform is incorporated into the mezzo level, and the soft environment of transport logistics is in the macro level, meaning it will influence and safeguard the operation of the former two gradations.

In the market system, transport logistics enterprises are the principal parts of supply. The logistics services provided by the enterprises are objects of the market. Supply of services depends on demand for transport logistics. The relationships between the principal parts and objects—namely, supply and demand, competition, pricing, benefit, and risk—are determined by market mechanisms.

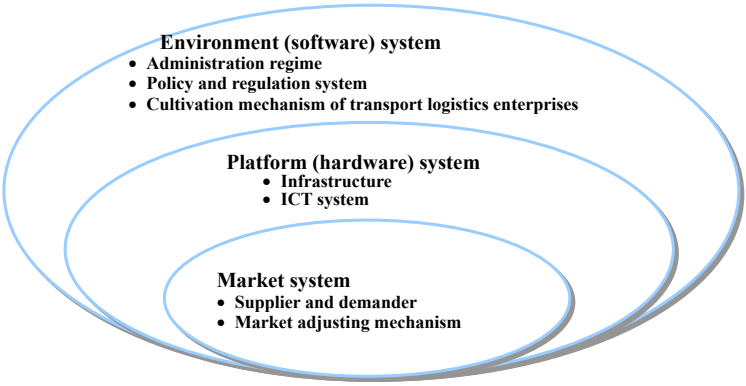

Figure 2-3: The gradational relationship among ATL components

Source: Author

Transaction activities are carried out in the platforms of infrastructure and information systems. In this context, the improvement of platforms is an assurance to strengthen the capability of service and enhance the effectiveness and efficiency of social logistics. For the hardware platform, standardization is of great significance in carrying forward the construction and improvement in operating efficiency of the infrastructure and information systems.

The administration regime and regulatory system is a macro environment not only for the operation of transport logistics firms, but also for the construction of transport logistics infrastructure and information systems. Consequently, a favourable macro environment and supporting conditions are guarantees for the healthy operation of ATL.

2.5 The foundations for restructuring the architecture of Chinese transport logistics

To create a well-equipped platform and a good atmosphere for Chinese transport logistics, the

ATL should be restructured in China. In the course of restructuring, China has to learn from the experiences and lessons from its foreign counterparts while taking the reality of Chinese transport logistics into account. Based on this conclusion, the following sections will discuss the foundations for restructuring ATL in China.

2.5.1 Foundation one: Foreign (western) countries' experiences in transport logistics administration and regulatory regimes

OECD: "Transport Logistics: Shared Solution to Common Challenges"
In order to establish efficient and environmentally friendly global logistics networks in the 21st century, OECD initiated a collaborative study on freight transport logistics in 1996. The aim of the trilateral (Asian-Pacific, European, and North American regions) co-operative project was to understand the current situation of logistics systems in and across various regions and to identify problems specific to each region. According to the report "Transport Logistics: Shared Solution to Common Challenges," which was produced from this research, businesses are seeking to develop and organize strategic, efficient, and worldwide networks. In order to promote such global logistics networks, which are also compatible with sustainability objectives, governments need to develop and implement cohesive transport policies both individually and collectively.

The report identified the advancement and effects of transport logistics not only from the viewpoint of industrial or national competitiveness, but also from that of global social optimization, taking into account the perspectives of consumers, shippers, logistics service providers, and government agencies. The report mainly examined the development in trade networks and global transport logistics, the need for logistics infrastructure and information technology development, changes in the labour market of logistics, and the need for a new logistics evaluation system. Some findings and suggestions (solutions) are cited from the report as follows.

In order to increase competitiveness by promoting the opportunities afforded by logistics as well as achieve sustainable development, the role of government was addressed in the report. This role is embodied in order to develop an integrated policy framework to achieve broader socio-economic objectives. The range of the integrated policy issues are wide and extend beyond the jurisdiction of government agencies narrowly focused on improving the performance of the transport sector.

By taking advantage of the enhanced planning and coordination possibilities offered by ICT, logistics could contribute to the achievement of sustainability objectives by improving the level of service offered by intermodal transport to make it more attractive to shippers. However, the report argued that this would require coordinated interventions by governments, including harmonized regulations, and the standardization of frameworks surrounding the use of technologies and infrastructures.

Integrated transport infrastructure networks are prerequisites for global logistics. To this end,

the report deemed that development of the fundamentals of transport logistics in Asian has not kept pace with the sector's rapid growth and lags far behind that of North America and Europe. It also pointed out that, in both developed and developing countries, financial instruments available to governments for the development of infrastructure are still not sufficiently flexible, prevalent, or transparent to cover and serve current needs.

The report asserted that logistics and ICT developments necessitate changes in the demand for skills. Consequently, improved training and qualification systems are needed to respond to these developments. Human resource development in support of the freight industry should be considered both a public and a private sector responsibility.

As to the evaluation system of transport logistics, the report considered both the present micro and macro indicators to be inadequate for assessing the performance of the supply chain. Therefore, there is a need to develop a multi-criteria assessment system at a meso level for conducting a comparative evaluation of logistics services in different countries, which will cover costs, quality of logistics services, and impacts on socio-economic factors.

In order to achieve efficient global logistics systems, the report emphasized the extensive cooperation and collaboration among private corporations, governments, and international organizations. It held that governments need to prepare the framework for advanced global logistics systems, where important cross-border issues such as customs clearance processes, deregulation, and development and maintenance of intermodal systems should be addressed.

Japan: New Administrative Programme of Integrated Logistics

In order to forcefully lead and promote the growth of logistics and distribution, the Japanese government has drawn up and put into effect numerous logistics policies over the past decades. For instance, a significant guideline policy—"*Administrative Programme of Integrated Logistics*"—was implemented in April 1997. The aim of the policy was to facilitate the provision of logistics services efficiently and ecologically for customers in the Asian-Pacific regions by improving the coordination of the various agencies. The effect of the implementation of the policy was obvious in maintaining Japan's position as a regional logistics hub (Logistics Techniques and Applications, 2002).

With the increasing globalization of the world economy and the rapid growth of ICT, the Japanese government recognized the inadequacy in the administrative programme four years later. In order to conform to new trends and create an attractive environment for enhanced business competitiveness, Japan faced two new needs for logistics development: strengthening the construction of efficient logistics infrastructure and the development of a *recycling society* due to the increasingly serious environmental pollution. To this end, the Japanese Cabinet drafted "*Action plan for the reformation and innovation of economic structure*". Based on the action plan, *New Administrative Programme of Integrated Logistics* was worked out in December 2000.

The new programmatic policy document was divided into two sections. One section focused

on the basic thinking of the development of integrated logistics, which included the new objectives for strengthening business competitiveness, the improvement of modern IT, and the development of a 'recycling society'. With a view to reaching the objectives, the direction and focal point of administration and the responsibilities for both central government and local government were clarified in this section.

The other section focused on countermeasures and policies. In order to increase the efficiency of the logistics system, the document suggested advancing the integration, information application, and standardization of logistics. In the meantime, the administration regime had to be restructured so as to improve the efficiency of government agency. To improve the logistics infrastructure, the document suggested raising the function of ports and terminals. In addition, ports should operate around the clock and provide "one-stop shopping" services and electronic declarations in order to improve their efficiency. To build a recycling society, the new administrative programme recommended reducing the energy consumption of transport vehicles and strengthening the seamless linkages of different modes. Adjusting the layout of logistics and distribution centres to increase the efficiency of truck transport, and controlling traffic flows in urban districts were also addressed as a significant approach to the construction of an eco-society system.

According to the above, both the OECD report and the Japanese administrative programme emphasized the necessity of governmental involvement in the organization and coordination of logistics. At the same time, the important roles of logistics infrastructure, facilities, and information system were also highlighted in both documents. This has been of considerable inspiration for the restructuring of ATL in China.

2.5.2 Foundation two: The intrinsic requirements of transportation development

Transportation is advancing to an intelligent integrated system. With the emerging demand of value-added logistics services, transportation development should meet the requirements of the manufacturing and commerce sectors. Transport should give full play to the improvement of the operation effectiveness and cost-efficiency along the logistics chain. To this end, the barriers spanning various transport modes need to be removed in order to enhance the development of intermodal transport.

Thus, the construction of ATL needs to be extended from the AT system. Just as shown in Figure 2-3, in the second gradation of ATL, the transport logistics platforms of the infrastructure and information systems have been introduced into logistics nodes such as logistics park (villa) and logistics and distribution centre. In the third gradation, the cultivation mechanism of the transport logistics enterprise is defined to encourage the development of social logistics rather than solely the development of transport logistics enterprises. In the mean time, the restructuring of the regulatory environment and administration system also need to incorporate the concept of logistics into the transport system so as to safeguard the healthy operation of transport logistics.

In general, the restructuring of the transport logistics system should merge the characteristics

of transport as well as reflect the requirement of logistics.

2.6 Conclusions

The current trends in transport logistics strategy are captured by alliances, TPL, value-added logistics services, dedicated terminals, and the development of inland transportation. Following worldwide trends, transportation is currently evolving into the stage of logistics after experiencing two periods of unimodal- and multimodal transport, respectively. In light of the inherent linkages and characteristics of transport and logistics, an ATL should be established by means of merging the features of logistics into AT. Accordingly, the theoretical framework for the architecture of Chinese transport logistics (ACTL) should include the components of ATL as well as the gradational and structural relationships among these components and the rules and policies that improve and supplement them, for the purpose of regulating the operation of Chinese transport logistics. In the ACTL, the construction of two fundamental platforms—infrastructure and information—as the hardware is of great importance for the development of Chinese transport logistics. Meanwhile, rules and policies, serving as the software of ATL are obviously playing very important roles in an emerging logistics market like China, These include administration and supervision of the transport logistics market; market entry and withdrawal; coordination mechanism among various operating and managing initiatives in transport logistics; and standardization and normalization of transport logistics. In this context, ATL has three gradations. The basic gradation is the market system, consisting of the supply of and demand for transport logistics services. The second gradation is the platform (hardware) system, which includes the transport logistics infrastructure and information system. The third gradation is the environment (software) system, which covers the administration regime, the policy and regulation system, and cultivation of transport logistics enterprises. To restructure ATL in China, foreign (western) country experiences in transport logistics administration and regulatory regimes, as well as the intrinsic requirements of transportation development, are used as the foundation.

Chapter 3 Analysis of the Market Structure of Chinese Transport Logistics

As defined in the previous chapter, ACTL refers to how all parts of the ATL work together to enhance the competitiveness of Chinese transport logistics (CTL) and ensure the provision of efficient and effective transport logistics services for the development of the national/regional economy. This means that the architecture ought to cover a broad area of interest—not only of transport logistics service providers', but also of authorities'.

The aim of this research is to define the constitution of ATCL according to the realities and environment of Chinese transport logistics. Therefore, the state-of-the-art Chinese transport logistics market structure, the characteristics of supply and demand, and the market competitiveness, are reviewed in this chapter, based on *in situ* investigations, questionnaires, and expert advices.

3.1 A general overview of market structure of Chinese transport logistics

The trend towards globalization and logistics is in the process of reshaping transport activities (OECD, 2002). Transport is no longer limited to just movement of goods across space. Currently, the scope of transport logistics has grown to such and extent that it influences what to produce, where to produce, and in what quantities. It is a value-adding component that is incorporated into strategic management and operational decisions of firms through transport logistics (Chatterjee et al, 2002). Thus, the transport logistics market is defined as, among others, comprising those consumers (shippers) interested in the transport logistics services who have the resources/abilities to purchase those services. Transport logistics demand in this context refers to transport/distribution, storage and handling, and other logistical services supplied by transport logistics operators. Among the services, transport/distribution is currently the main logistics service demanded by shippers in China, accounting for more than 60 percent of the overall transport logistics demand (Report of China Logistics Development, 2005).

The success of economic reforms in China has already brought far-reaching change to its economy and, consequently, to the transport logistics sector (McKinsey & Company, 2001). Since China opened to outside markets in the 1980s, the national economy has expanded steadily, with an average annual growth rate of 9.6 percent in gross domestic product (GDP) from 1980 to 2000. Growth has remained strong in the current century. For the first time, the per capita GDP topped $1000, reaching $1090 in 2003, and the GDP in 2004 expanded at a pace of 16.4 percent after 11.5 percent in the previous year—the highest rate in the past four years. In 2004, China's GDP reached RMB 13.65 trillion (US$1.65 trillion), as exports continued to drive expansion (National Bureau of Statistics (NBS), China, 2005). China's economic growth trend is shown in Figure 3-1. Simultaneously, Chinese industrial output and

wholesale/retail trade have also been growing explosively in the past decades, as shown in Table 3-1. This indicates great potential for the demand of transport logistics services, for raw materials, semi-finished products, and consumer goods.

Table 3-1: Chinese industrial output and wholesale/retail trade since 2000

Year	2000	2001	2002	2003	2004	Increase Rate in 2004 over 2003 (%)
GDP (Billion RMB)	8946.8	9731.5	10517.2	11725.2	13651.5	16.4
External Trade (100 Million US$)	4742.9	5096.5	6207.7	8509.9	11547	35.7
Gross Industrial Output Value (100 million RMB)	85673.7	95449.0	110776.5	142271.2	187220.7	31.0
Wholesale and Retail Trade (100 million RMB)	23042.3	25510.8	34514.2	37692.5	44839.9	19.0

Source: National Bureau of Statistics of China (NBS), 2005

With a booming economy, China's external trade has also seen a significant surge; in particular, since becoming a member of WTO on 11 December 2001, China's growth in external trade has averaged more than 20 percent per year. The total value of imports and exports in 2004 reached US$1,154.7 billion, up 35.7 percent over the previous year (cf. Figure 3-1). Of this total, the value of exports was US$593.4 billion, up 35.4 percent, and the value of imports was US$561.4 billion, up 36.0 percent (NBS, 2005). Accordingly, external trade accounted for an unusually large proportion of China's GDP: 70 percent in 2004 compared to 43.9 percent in 2000 and 29.8 percent in 1990. In comparison, US foreign trade accounted for 20.4 percent of China's GDP in 1990 and 23.6 percent in 2003 (The China Business Review, 2005). The highly and successively increasing dependence of China's economy on external trade, as shown in Figure 3-2, indicates that the Chinese transport logistics industry is playing a greater role in the secure development of the Chinese economy (Report of China Logistics Development, 2005).

The ongoing growth of China's economy and external trade is stimulating demand for transport logistics and thus the expansion of China's transport and logistics sector itself. As shown in Figure 3-3, the total freight volume in China has been rapidly rising over the past decade. Total freight volumes in terms of tonnes and tonne-km increased by 12.4 percent and 23.8 percent, respectively, in 2004 to 16.7 billion tonnes and 6669.8 billion tonne-km individually. Of the total, all transport modes increased at different rates, as seen in Table 3-2; the freight volumes of water transport and air transport showed much higher growth rates than the other modes. The soaring development of external trade contributed to the rapid growth of the two modes, especially of sea transport, considering that 90 percent of China's external

trade in volume is carried by sea (MOC1, 2005).

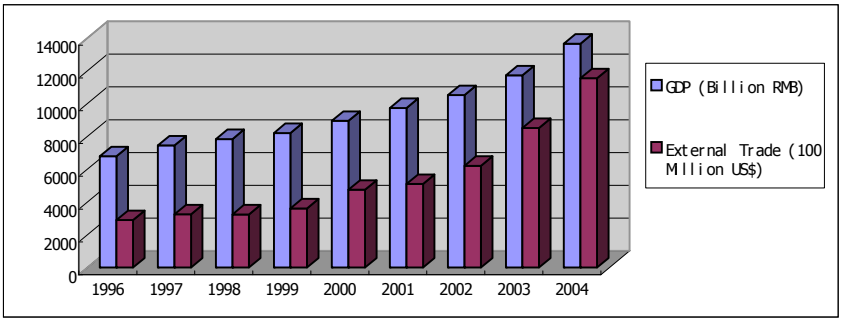

Figure 3-1: Growths of China's GDP and External Trade from 1996-2004
Source: The National Bureau of Statistics, 2005: Report on China Logistics Development, 2005

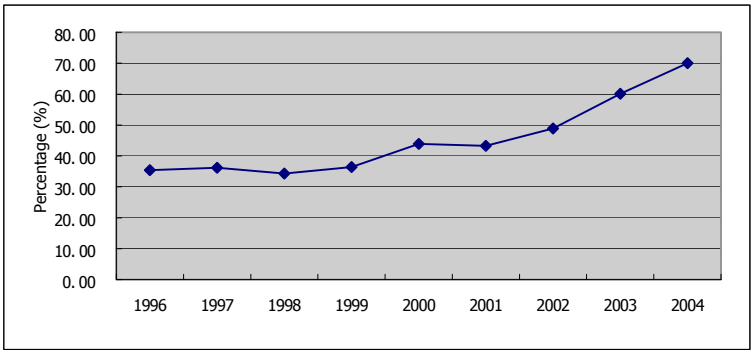

Figure 3-2: Dependence of China's economy (GDP) on its external trade from 1998-2004
Source: The National Bureau of Statistics, 2005: Report of China Logistics Development, 2005

This rapid growth rate is also reflected in China's seaport development. The throughputs of ports throughout the country in 2004 totalled 4 billion tonnes, up 21.3 percent over the previous year, of which, cargoes for external trade amounted to 1.15 billion tonnes, up 18.4 percent. Keeping pace with external trade, container traffic at China's ports has also been growing robustly. Overall, container traffic in Chinese ports reached 61.5 million 20-foot equivalent units (TEU) in 2004, up 27 percent from 2003's 44.9 million TEU (MOC1, 2005). Over the last two years, container traffic grew 21.1 percent annually, approaching the 28-percent-per-year increase in China's external trade during the same period. Table 3-3 provides container traffic at the nine major container ports in Chinese mainland from 2002 to 2004 (The China Business Review, 2005).

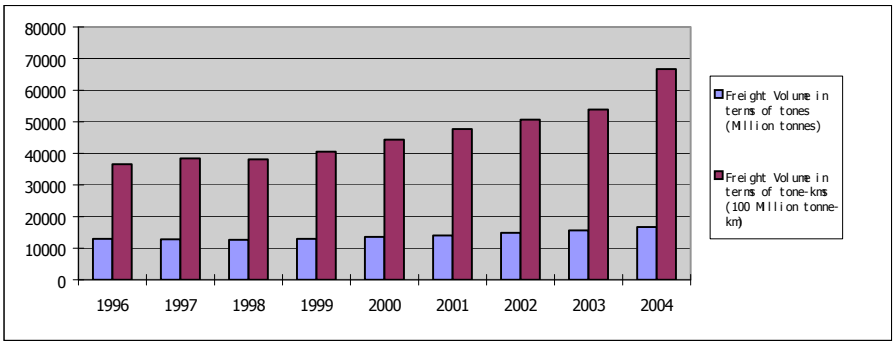

Figure 3-3: China's total freight volumes from 1996-2004

Source: The National Bureau of Statistics, 2005
MOC1, 2005
Report of China Logistics Development, 2005

Table 3-2: Freight volumes carried by transport modes in China in 2004

Mode	In terms of tonnes (billion tonnes)	Change over previous year (%)	In terms of tonne-km (billion tonne-km)	Change over previous year (%)
Rail Transport	2.49	12.6	1928.9	11.8
Highway Transport	12.45	7.3	759.6	7.0
Water Transport	1.87	18.6	3897.3	35.7
Air Transport	0.0028	26.5	7.2	24.0
Pipelines	0.25	12.4	76.8	3.9
Total	17.06	9.3	6593	23.8

Sources: NBS, 2005
Report of China Logistics Development, 2005

Table 3-3: China's Top Container Ports, 2002–2004

(Thousand TEU)

Port	2002	2003	2004	2003 Growth (%)	2004 Growth (%)
1. Shanghai	8,612	11,282	14,557	31.0	29.0
2. Shenzhen	7,618	10,610	13,615	39.3	28.3
3. Qingdao	3,410	4,250	5,140	24.6	20.9
4. Ningbo	1,859	2,763	4,006	48.6	45.0
5. Tianjin	2,408	3,020	3,814	25.4	26.3
6. Guangzhou	2,173	2,760	3,308	27.0	19.9
7. Xiamen	156	2,330	2,872	1,395.5	23.2
8. Dalian	1,352	1,670	2,211	23.5	32.4
9. Zhongshan	481	760	930	58.0	22.4

Source: The China Business Review, July-August 2005

Although freight volumes in terms of both tonnes and tonne-km have seen rapid increases over the past few years, the increasing rate of the latter is bigger than that of the former, as shown in Table 3-4. The growing difference means, among other things, that the average haulage distance has been increasing. The expansion of coverage and regions of trading, especially in high-volume bulk cargoes, is the main contribution to the extension of average haul. Figure 3-4 provides the changes in the average haul of various transport modes in China from 2000 to 2004.

Table 3-4: Growth rate in freight volume, 2000-2004

Year	Growth rate of freight volume in terms of tonnes	Growth rate of freight volume in terms of tonne-km
2000	5.08	9.20
2001	3.17	7.65
2002	5.83	6.24
2003	5.26	6.26
2004	9.3	23.84

Source: The National Bureau of Statistics, 2005
MOC1, 2005
Report of China Logistics Development, 2005

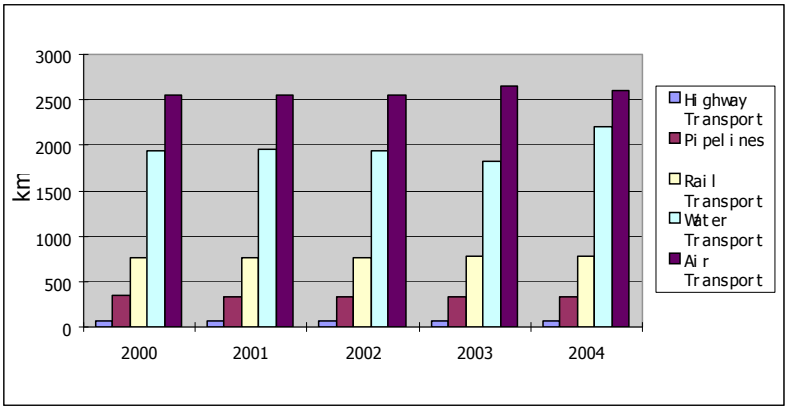

Figure 3-4: Average haul of transport modes in China (km), 2000-2004
Source: NBS, 2005

Economic development and wealth make China an emerging major importer of raw materials; in particular, the surging development of Chinese iron and steel, energy, and petrochemical industries drives the fast-growing demand for raw materials and natural resources. As a result, bulk cargoes over long distances, such as crude oil and iron ore, which are mainly imported from international markets, have increased rapidly. The demand for crude-oil imports grew to almost 60 percent in 2003 from the previous year (China Business Information Center, 2006). Iron ore imports, especially from Brazil and Australia—crucial material used for making steel

for the auto and construction industry—have increased tremendously in the past few years; the growth rate has been 30 percent year-on-year since 2003.

Despite the obvious progress in the improvement of China's transport logistics, its capacity cannot yet keep pace with China's rapidly growing economy. It can be seen from Figure 3-5 that the rate of increase of freight transport has always been lagging behind that of the Chinese economy. This necessitates the development of a larger and more efficient transport logistics industry to serve China's rising economy and external trade. The current status of the Chinese transport logistics system will be further discussed in the next section (3.2).

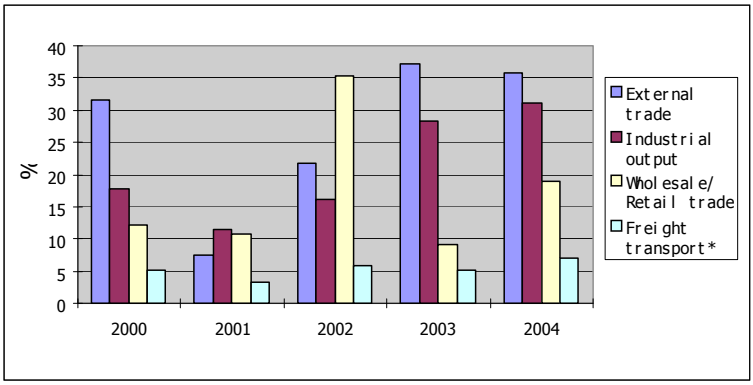

Figure 3-5: Comparing the selected economy growth rates with the increase rate of freight transport, 2000-2004

* Freight transport in terms of tonnes

Sources: NBS, 2005
MOC1, 2005
Report of China Logistics Development, 2005

3.2 Demand characteristics of Chinese transport logistics services

During the central planning years, the concept of logistics did not exist in China; or, to be more precise, the concept of logistics was totally different from that in developed market economies. China's state-owned enterprises (SOE) were actually production units rather than real enterprises. The production was arranged based on the state plan. Firms did not need to bother with the distribution or marketing of products because the government arranged for the distribution of products through its own distribution and transport system/channels. Raw materials and in-process-products needs were also assigned by the government.

Since the opening of China's markets in 1978, the distribution and logistics system has been fraught with infrastructure problems and difficult legal issues (Power, 2001). China's logistics are dynamic and complex, with the characteristics of both planned and market-oriented economies. China's entrance into the WTO in 2001 led to the establishment of a

market-oriented economy for its transport logistics, due to central and local government's attention on the efficiency and effectiveness of transport logistics services, resulting in encouraging progress on the improvement of infrastructure and networking. Nevertheless, until now, the Chinese transport logistics market has remained fairly underdeveloped for two main reasons: (1) the dominance of SOEs and their tendency to own and operate all functions themselves; and (2) the predominance of cellular economies with limited, local distribution areas (McKinsey & Company, 2001). Chinese transport logistics services have witnessed several features that have been increasingly evolving since the beginning of Chinese economic reform; these will be discussed in the following sections.

3.2.1 Reluctance in outsourcing logistics activities

Outsourcing is the strategic decision to contract out one or more activities required by the organization to a TPL specialist (Hong *et al*., 2004). Thus, the overall market capacity for the demand of logistics service, in particular TPL services, depends to a large extent on the firms' willingness to outsource logistics activities, including transportation and warehousing, to outside firms. Obviously, the degree of outsourcing varies and differs from one industry to the next. Table 3-5, which highlights the annual survey results released by the *China Association of Storage and Warehousing (CASW)* since 2001, provides the degree of logistics activities outsourcing by Chinese commercial and manufacturing firms in 2001 and 2004. The table shows that Chinese enterprises are reluctant to outsource their logistics activities, and there are no signs of spectacular increase in the willingness to operate their logistics services externally. Compared to developed countries and areas, the degree of logistics outsourcing in China remains low. A survey carried out by *Capgemini* (2004) revealed that Western European respondents continue to spend a larger portion of their logistics budget (61 percent) on TPL services than do those in North America (44 percent) and Asia-Pacific (49 percent), but Latin American respondents spend more of their logistics budget (65 percent) on TPL services. Nevertheless, the low level of outsourcing in China presents to some extent a great market potential for TPL, considering China's rapid development of manufacturing, international trade, and domestic wholesale/retail trade.

The lack of awareness of concept and importance of logistics are the main factors affecting Chinese enterprises in outsourcing their logistics services (Hong *et al*., 2004). CASW 2001 survey investigated the importance of logistics for commercial and manufacturing firms. Among the 450 large and medium-sized industrial and commercial enterprises surveyed, 48.7 percent thought that the impacts of logistics were not obvious for their enterprises, and only 7.9 percent thought that logistics were very important for them. In this context, the concept of logistics is not popularized in Chinese enterprises. A great number of enterprises—especially SOEs—have not yet realized the importance and urgency of the use of TPL, pursuing instead the traditional "big-whole and small-whole" model (meaning whatever the size of the firm, everything should be fully equipped in-house on their own) to operate logistics on their own, which inevitable adds up to overall costs.

Other factors impeding logistics outsourcing include the traditional thinking of self-reliance; inefficient management on the shippers' side; and low service quality and high operational

costs on TLP's side. Furthermore, unfavourable logistical circumstances, such as segregated administration regimes, the comparatively low degree of commercialization, diversification, and specialization, make Chinese firms run their logistics activities in-house.

Table 3-5: Degree of logistics service outsourcing: 2001 and 2004

(%)

Logistics Service Providers (LSP)	First-Party Logistics (In-house)		Second-Party Logistics (Supplier/Buyer)		Third-Party Logistics (TPL)		Total
	2001	2004	2001	2004	2001	2004	2001/2004
Supply of Materials for Manufacturer	8	25	71	56	21	19	100
Distribution of Finished Products for Manufacturer	43	16	36*	53*	21	31	100
Distribution of Goods for Commercial Firms (Retailer/Wholesaler)	13	78	74	5	13	17	100

*Partially outsourcing and partially in-house

Source: CASW, 2002, 2005

As mentioned in McKinsey & Company's (2001) report *China's Evolving Logistics Landscape*, most domestic logistics and goods transport needs have largely been met by the SOEs themselves, as they have historically owned and operated their own trucks to deliver goods downstream to distributors and wholesalers. These distributors and wholesalers in turn have bought the finished goods and moved them to consumers through a highly antiquated and fragmented retail trade, leaving manufacturers out of the logistics loop.

Compared to Chinese SOEs, Sino-foreign joint ventures have a much stronger disposition to outsource their logistics and transport activities. Currently, approximately 400,000 joint-venture enterprises operate in China (CASW, 2002). The experiences in outsourcing logistics in the developed market economy of these foreign firms make them realize the importance of logistics for enterprise. Through outsourcing, they can focus on running their core business in order to improve productivity and profit. The trend has been stirred by the Chinese entry into the WTO. In light of China's promises to the WTO, the Chinese logistics market—which includes road haulage, forwarding/NVOCC, warehousing and distribution—is further opened to foreign investment. As such, increasing numbers of foreign enterprises have entered into the Chinese market, which will further enlarge market demand for Chinese logistics services. According to *China Logistics Development Report* (2005-2006), the outsourcing of transport logistics services will continue to expand roughly by 33 percent annually through 2010; the market value will increase from 40 billion RMB in 2004 to 230 billion RMB in 2010 thanks to the improvement of Chinese enterprises' supply chain management and stronger MNC interest and demand for TPL. MNCs relying on China as a

global sourcing base are inclined to use—and are experienced in using—TLP, especially those of TPL providers with which the MNCs have established relationships at home. More than 90 percent of MNCs in China currently contract at least a portion of their logistics business to TPL providers (The China Business Review, 2003).

Meanwhile, China's approximately 2 million private enterprises, accounting for one third of China's GDP, have developed a stronger willingness to outsource logistics services than SOEs (CASW, 2002).

3.2.2 Current and prospective logistics functions outsourced

The second demand feature of Chinese transport logistics consists of the type of the logistics functions outsourced. Obvious differences exist between comprehensive transport logistics services and traditional transport services. Traditional transport demand is limited to freight transport. With the globalization and specialization of the world economy and trade, demand for transport logistics has greatly changed. On the one hand, transport logistics demand has transformed from a quantity-oriented service to the quality-oriented one. The value attached to transportion is growing in tandem with the number of specialized cargoes and special service requirements. This requires the restructuring of operational models in the transport industry to better meet shipper demand for quality services. On the other hand, shipper demand demonstrates diversity and individuality, driving transport logistics providers to improve their flexibility and provide "tailor-made" logistics services to meet the changing demand.

Shippers' changing demand is evidenced by the outsourcing functions of Chinese firms. Compared to 2001, current logistics functions outsourced, as shown in Figure 3-6, remain limited to transport, distribution, and warehousing (CASW, 2005). Nevertheless, the scope of logistics activities outsourcing appears different from earlier years in that current Chinese manufacturers and commercial firms are showing a tendency to concentrate their outsourcing activities primarily on transport, distribution, and warehousing rather than outsource their logistics activities extensively, as found in CASW' first survey in 2001. This phenomenon suggests that Chinese enterprises are gradually understanding the essence of the logistics concept and no longer simply imitate their foreign counterparts as they did when first learning logistics ideas from developed countries a few years ago.

The evolution of logistical understanding can also be illustrated by Chinese enterprises' perspective of outsourcing functions. Figures 3-7 and 3-8 show the future demands for logistics services of Chinese commercial and manufacturing firms. Although the functions of transport, distribution, and warehousing still constitute a dominant part of outsourcing, information-based and value-added functions are present to a much larger extent than some years ago. For instance, about one third of commercial firms demand value-added and information-based logistics services, such as packaging/processing, logistics information system designing, labelling/bar-coding, and restructuring of logistics systems. Also, about one third of manufacturing firms require value-added and information-based services such as logistics consulting, customs clearance, logistics information system designing, and

restructuring of logistics systems. This evolution is partially consistent with Laarhoven, Berglund, and Peters' (2000) finding, in their survey of shippers in European countries involved in outsourcing their transport, warehousing, and other logistics activities.

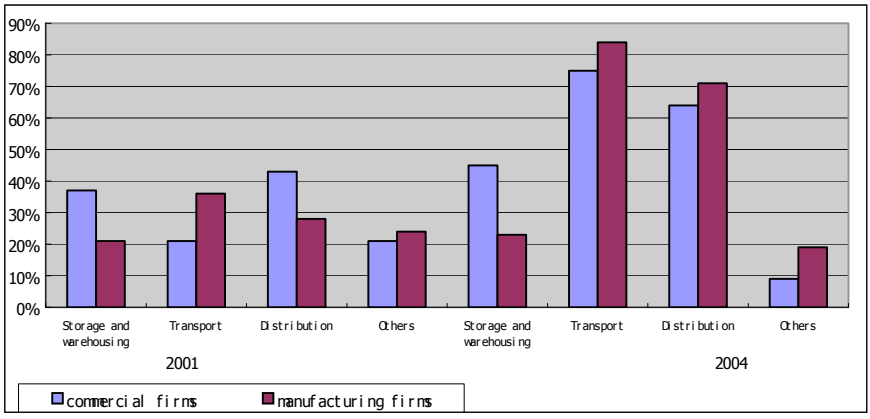

Figure 3-6: Comparing Logistics activities outsourcing in 2001 and 2004
Source: CASW, 2002, 2005

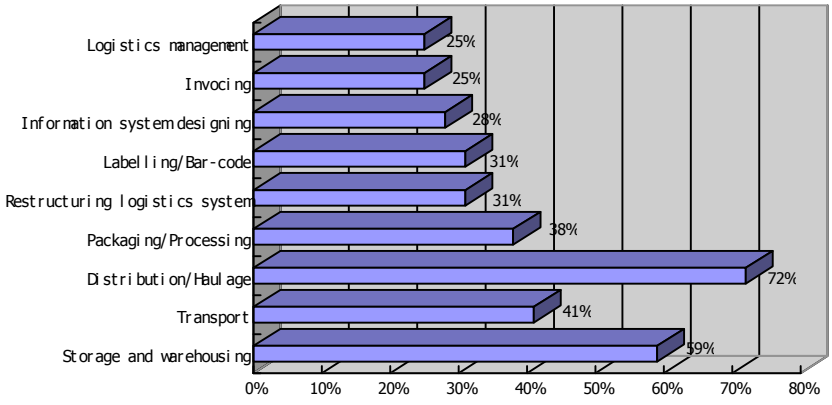

Figure 3-7: Future demands for logistics service of Chinese commercial firms
Source: CASW, 2005

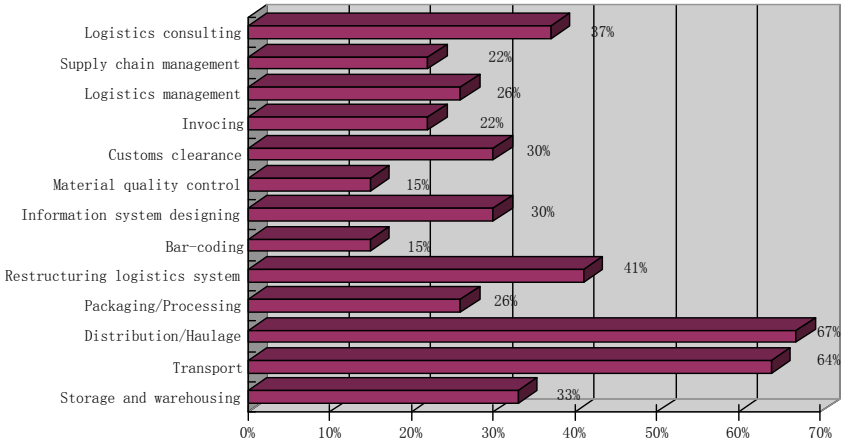

Figure3-8: Future demands for logistics service of Chinese manufacturing firms
Source: CASW, 2005

3.2.3 Regional disparity in transport logistics demand

With the shift to a world manufacturing centre and rising living standards among citizens, transport logistics is increasing in importance for Chinese manufacturing and commercial firms, as restructuring of the firms often entails relying on external vendors—an attribute of Just-in-Time (JIT) production systems (McKinsey & Company, 2001). However, the trend has been unevenly spread, with the most dynamic increases in China's eastern coastal area, due to the faster economic and international trade growth in this area. In 2004, the top nine provinces/municipalities ranked in terms of volume of external trade—including Guangdong, Jiangsu, Shandong, Shanghai, and Tianjin—accounted for more than 90 percent of China's total. These nine provinces/municipalities are all along the coast. The remaining 22 interior provinces and municipalities, constituting 68.3 percent of the total population, accounted for less than 10 percent of the external trade. Meanwhile, regional income disparities between eastern and western regions continue to worsen (Gezen, 2005). As a result, distribution/retail in China's eastern region is far better developed than that in the western region. The proportion of the number of chain/retail stores in the eastern region to China's total reached 75.3 percent in 2003, up 1.4 percent from the previous year, as shown in Figure 3-9. Of this, the number of chain/retail stores in Shanghai, Beijing, Jiangsu, and Guangdong accounted for almost 50 percent of the total. Accordingly, the turnover of chain stores and retail firms in the eastern coastal area accounted for over 80 percent of China's total in 2003. The same four provinces/municipalities—Shanghai, Beijing, Jiangsu, and Guangdong—created 70 percent of China's total turnover of chain stores and retail; Shanghai alone occupied one third of the

total (Report of China Logistics Development, 2005).

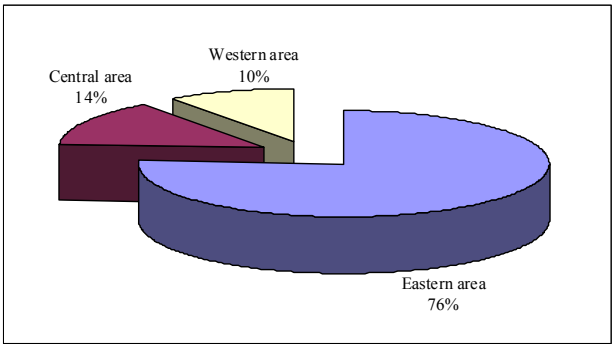

Figure 3-9: Regional distributions of China's chain stores
Source: Report of China Logistics Development, 2005

Consequently, the third feature of China's transport logistics demand presents a difference between China's eastern coastal area and its central and western areas; coastal regions have grown rapidly, benefitting from logistical accessibility and well-developed infrastructure, while those in the interior have fallen behind. In fact, transport logistics demand has remained concentrated in the central and coastal provinces, around the three major areas of Bohai Bay (Beijing/Tianjin), the Yangtze River Delta (Shanghai/Ningbo), and the Pearl River Delta (Guangzhou/Shenzhen). Cargo movement and industry output are highly concentrated in these areas too; the country's top seaports/airports are located here, and the cities of these three areas are well connected by road networks. Moreover, the populace enjoys some of the highest per capita incomes in the country (McKinsey& Company, 2001). Figure 3-10 and Table 3-6 show the dominancy of eastern coastal seaports and airports in China's freight cargo handled.

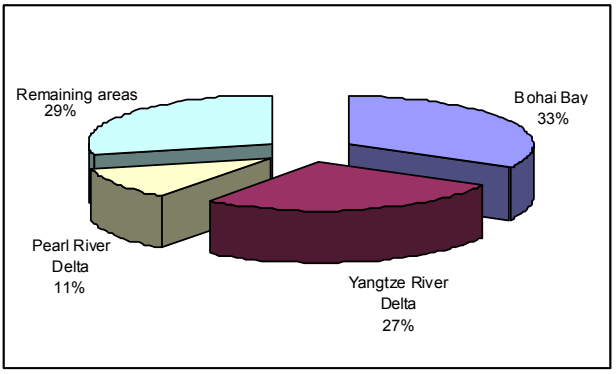

Figure 3-10: Shares of throughputs of eastern coastal seaports in 2003
Source: MOC1 and Report of China Logistics Development, 2005

Table 3-6: Freight volumes of eastern coastal airports: 2002-2003

(Million tonnes)

Airports		2002	2003
Total		40183.4	45174.4
Eastern Coastal Areas	Bohai Bay	9080.1	9718.8
	Yangtze River Delta	12680.7	16335.8
	Pearl River Delta	8053.9	8241.2
% Eastern coastal areas of the total		79.97	81.36

Source: Report of China Logistics Development, 2005

Apart from undeveloped manufacturing industry, international trade and domestic distribution/retail trade in the western area, an insufficient transport logistics infrastructure, and an undeveloped network in this region affect the regional imbalance of China's transport logistics demand. Current Chinese government efforts aim to narrow the widening wealth and income disparities between the two regions by attracting more domestic and foreign investment into the interior region (Nogales *et al.*, 2004). Following policy changes brought about by China's Great Western Development Strategy (launched in 2000) and Central Rising Strategy (launched in 2006), which boosts public spending on infrastructure and offers private investment incentives to encourage industry to migrate inland, production centres are being created in places in central and western China that have low unit production costs (Kwan & Knutsen, 2006). This tendency will even out to a great extent the imbalance of transport logistics between eastern and western areas.

3.2.4 Market segmentation

The value of the Chinese transport logistics market has consistently experienced double-digit growth each year since the beginning of the decade (Datamonitor, 2006). In 2004, the market generated total revenues of 2344.2 billion RMB, representing an increase of 13.9 percent over the previous year. Focusing its study on the retail, automotive, consumer, hi-tech, and pharmaceuticals segments, Datamonitor (2006) concludes that the retail sector is the most profitable for China's logistics market, generating 480 billion RMB ($62.1 billion) of revenue in 2005, or the equivalent of 76.2 percent of the total market's value. The consumer segment, whose 95.9 billion RMB ($12.4 billion) value generates 15.3 percent of total market revenues, is the second most profitable after retail, as shown in Figure 3-11. The overall growth of the Chinese economy and the concomitant rise in consumer demand and disposable income should ensure sustained growth in all segments of the transport logistics market.

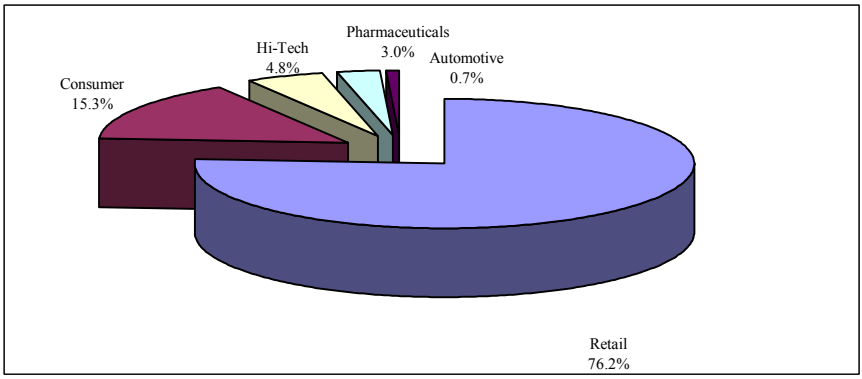

Figure 3-11: China Logistics Market Value*: Percent share, 2005

*The logistics market value is composed of all expenditures (in-house and outsourced) from the transportation, distribution, and management of retail, consumer electronics, automotive, hi-tech, and pharmaceutical sectors.

Source: Datamonitor, May 2006

Indeed, China's distribution and retail trade has witnessed a great upsurge over the past few years. Large chain stores and hypermarkets are growing rapidly, reflecting the preference of consumers for larger, more appealing stores offering mixed choice assortments, low prices, and trusted brands (McKinsey & Company, 2001). The turnover of top 30 chain stores amounted to 374.4 billion RMB in 2004, up 32.9 percent from the previous year. Table 3-7 depicts the turnovers of China's top five chain stores in 2004. The emergence of new retail channels is creating demand for transport logistics solutions. Just one consumer electric appliances chain store, Guomei, has increased its number of stores by more than 30 times, growing from 7 to 227 in just 6 years (1998 to 2004). In the process, its presence has expanded from Beijing to Shanghai and several second-tier cities, including a number in northeast and southwest China. Growing sales from such large chain stores, including Guomei, Suning, etc., made up about 7.2 percent of total retail sales in China by 2004 (Report of China Logistics Development, 2005). In this context, while traditional trade in China still cannot be ignored, modern retailers are making real inroads into the first-, second-, and even third-tier cities, creating a greater need for specialized transport logistics solutions to serve these outlets and an ability to bypass trade distributors—that is, wholesalers (McKinsey & Company, 2001).

In addition to the rapid growth of the economy and the concomitant increase in living standards, the deregulation and decentralization of Chinese transport logistics have contributed to the fast development of the distribution and retail industries. In recent years, China's regulatory environment has shifted to accommodate much broader business scopes and more efficient operating structures for wholesalers, retailers, distributors, and other companies by removing layers of bureaucracy. Under this loosened business environment, more and more foreign-invested companies are now using foreign-invested commercial enterprises (FICEs) for retail, wholesale, franchising, and commission-based agency services

to trim the fat from current distribution channels and provide better products and services to customers (FICE, 2006). As a result, distribution and retail industries are facing new opportunities and more choice for their logistics needs.

Table 3-7: Top five chain stores in China, 2004

Ranking	Chain store	Turnover (Billion RMB)	Growth (%)	Stores (Number)	Growth (%)
1	Bailian Group	67.6	22.5	5493	25.1
2	Guomei Electric Appliance	23.9	34.3	227	63.3
3	Dashang Group	23.1	27	120	25.0
4	Suning Electric Appliance	221.1	79.6	193	30.4
5	Carrefour (China)	16.2	20.9	62	51.2

Source: Report of China Logistics Development, 2005

At the same time, Chinese manufacturers and MNCs investing in China in particular are increasingly adopting integrated national approaches and requiring time-definite delivery of smaller shipment sizes, especially in sectors such as auto components and high tech. Over the past few years, China is witnessing a booming demand for cars with the rising living standards. As a result, Chinese automotive production has increased rapidly; China manufactured 2.24 million automobiles in 2004, up 13.3 percent from previous year. For the automotive and hi-tech manufacturers, consumers are seeking more sophisticated road transport and distribution solutions, leading automotive and hi-tech logistics to become a prominent segment in recent times.

Express and parcel post is another prominent emerging market whose growth reached 23 percent in 2003. According to the US Coalition of Service Industries (USCSI), the compound annual growth rate (CAGR) of the market is estimated to be around 33 percent for the next three-year period, spanning 2004 to 2006 (Report of China Logistics Development, 2005). Datamonitor (2005) estimates China's express delivery market to be valued at $3.5 billion, noting that the driving factor behind China's growth is its increasing export activity with Europe and the U.S. China, the centre of current Asia-Pacific activity, will become the sixth largest express market in the world by 2010, provided it continues growing at an average 20 percent per year. Due to the deregulation of the Chinese distribution regime, express and parcel post alternatives are available to meet manufacturers' needs for delivery of time-sensitive items not only through international providers such as Fedex or TNT, but also through numbers of emerging domestic private express companies as well as the traditional supplier, China Post. As the express firms respond to a fast-growing demand within China, they are looking to less-than-truck-load (LTL) business as an economic and practical alternative to air transport.

In the consumer products segment, fast moving goods (FMCG) is a quickly emerging market in China. After two decades of rapid development, the spending power of Chinese consumers has risen significantly. Because of the increase in disposable income, consumption behaviour has shifted towards the luxurious level. People are increasingly receptive to quality products.

China's FMCG market has grown exponentially over the past decade. Changes in distribution infrastructure and relationships have directly affected the evolution of China's FMCG market (Atkearney, 2003). However, in general, the ratio of consumption spending to GDP in China remains relatively low. Thus, huge demand exists for quality, particularly for international brand goods. To this end, the total amount of FMCG consumption will further increase. Actually, China's FMCG has become a highly competitive market, featuring a variety of products, fast circulation, and low profits. In order to cut down on logistics costs, FMCG firms either establish their own logistics network to touch the end market directly, or outsource logistics to large and respectable logistics enterprises. This presents a prospective boom in the FMCG market.

3.3 Characteristics of Chinese transport logistics providers (TLPs)

Under the centrally planned economy, the Chinese government encouraged each province and city to be self-reliant, resulting in considerable industrial overcapacity but few logistical support (Powers, 2001). Manufacturers and retailers/wholesalers had little choice but to use a three-tiered distribution system organized along rigid, vertical command-and-control lines between central Chinese economic cities such as Shanghai, Beijing, and Guangzhou, provincial capitals and medium-sized cities, and smaller cities and towns. Under such state-controlled distribution networks, together with lack of well-developed infrastructure (road network), "the distributors essentially provided basic and simple logistics services, such as transport and warehousing but no, say, marketing support and sales reporting (for instance, Internet-based channel management, by keeping customers up-to-date with the latest market information and by efficiently responding to customers' needs, is so important for logistics service providers)" (Powers, 2001).

With its opening to the outside world—in particular its entry into the WTO, which removed restrictions in the provision of logistics services by foreign firms—China has designated logistics as a strategic industry and has taken a series of reform activities to establish a new logistics system in which enterprises under all forms of ownership—state, collective, private, and foreign—are allowed equal standing to engage in logistics activities while manufacturers are given a great degree of autonomy to choose logistics providers (Hong *et al.*, 2004). Retail channels are consolidating and modernizing in the top-tier cities, China's major consumption centres, and spreading to the next tier of cities. In addition, professional logistics service providers (such as TPL and truckers) are emerging in the Chinese transport logistics market (McKinsey & Company, 2001). In the meantime, the transport logistics infrastructure and network are being improved. Over the last few years, in order to develop a more integrated network of highways, railways, airports, and seaports, more than 80 percent of public investment has been directed towards transportation and logistics. A national express highway network linking the major cities was near completion in 2007. A number of logistics parks and distribution centres across the country are also being planned and/or have been set up. These are intended for transport logistics hubs/centres such as Guangzhou, Shenzhen, Beijing, Shanghai, Tianjin, Wuhan, Chongqing, and Dalian and will include facilities such as freight management, warehousing, and intermodal services. Computerized networks to link these

parks throughout the nation are also being planned and/or under construction (Frost & Sullivan, 2006).

While study on the development of Chinese transport logistics has given rise to more attention by the international academic society, literature has mainly focused on exploring problems with Chinese logistics providers from the perspective of foreign firms operating in China (J. Hong *et al*., 2004). However, little focus has been placed on such providers from their own perspective. In this respect, the following section will, based on a general survey of Chinese transport enterprises, discuss the current situation and trends of operations of Chinese transport enterprises together with a literature review of the related research on transport logistics in China.

3.3.1 Methodology

To understand the operational features of Chinese transport enterprises, the author of this thesis led and conducted a nationwide survey (with the support of MOC1) of Chinese transport logistics enterprises from March to May 2003. For this survey, a questionnaire was developed based on advice from logistics professionals and researchers from Wuhan University of Technology (WUT) and in consultation with government officials from MOC1 and Department of Communication, Hubei Province, P.R.C. and executives from transport logistics firms. The four-page questionnaire (see Annex 1), consisting of 50 questions, is divided into the following four parts.

- The first part of concerns the respondent companies' knowledge about the concept of logistics, as well as enterprise characteristics, such as size, customers, and type and scope of business.
- The second part focuses on the operations situation of the respondent companies, as reflected by a transport logistics information system, the capability of providing value-added services, service attributes, utilization of facilities and equipment, marketing and pricing policy, etc.
- The third part concerns future prospects for Chinese transport logistics from a supplier perspective, which include potential demand, foreign companies' penetration, future investment sectors, etc.
- The last part of the questionnaire involves the environment of the transport logistics industry in China, e.g. regulations, government interventions, and policy instruments that may help minimize the problems faced by transport logistics industries.

For the purpose of this research, transport logistics enterprises are defined to encompass freight transport (road, railway, air, waterways), forwarders, and specialist logistics providers originating from transport companies. As the research was funded by MOC1, who is exclusively in charge of road and water transport, the survey was mainly confined to road freight transport companies and shipping lines.

The investigated enterprises are distributed primarily in more than 10 provinces or municipalities in China—including Shanghai, Beijing, Guangdong, Zhejiang, Fujian,

Chongqing, Hubei, Shandong, Jiangsu, Shanxi, and Henan Province—covering the eastern, central, and western parts of the country. Due to its active transport logistics market, the eastern part was the key area investigated. The area distribution of the investigated enterprises is illustrated in Figure 3-12.

The questionnaire and a cover letter explaining the purpose of the survey was posted, emailed, or faxed to a random sample of approximately 200 Chinese transport logistics enterprises, including:

- Shipping lines: China Shipping Container Lines Co., Ltd. (Shanghai); Fujian Province (Xianmen) Shipping Corp.; COSCO Container Lines Co., Ltd. (Shanghai); SINOTRANS Container Lines Co. (Beijing);
- Forwarders: COSCO International Freight Co., Ltd. (Wuhan); Shanghai Changjiang International Freight Co., Ltd.;
- Logistics companies: COSCO Logistics Co., Ltd. (Gaungzhou); China Merchants Logistics Co. (Shenzhen); Shenzhen St-anda Logistics Co.; Shanghai Vastocean Logistics Ltd.; and
- Trucker: a number of freight trucking companies.

Interviews were also conducted with several transport logistics executives participating in the survey, based on the enthusiasm of the firm in mailing back the questionnaire.

During the three-month survey, approximately 40 firms returned usable replies, yielding a response rate of 20 percent. This is a fairly good response rate considering the survey was conducted in such an immature logistics market as China. Many of the respondent firms provided valuable and pertinent suggestions for the development of Chinese transport logistics. In this context, the survey provided useful data and information for the research while keeping researchers abreast of the current situation of Chinese transport logistics.

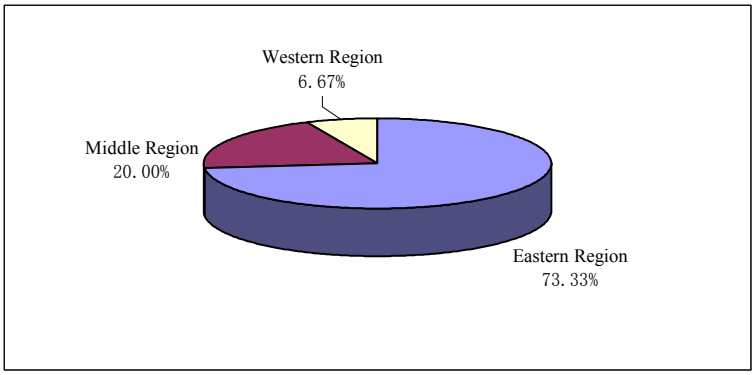

Figure 3-12: Regional distributions of the investigated transport logistics enterprises
Source: Author's drawing based on survey results

3.3.2 Findings

Knowledge about the concept of logistics

For a long time, Chinese enterprises were only familiar with the concept of physical distribution, traditionally called "wuliu" (meaning "the movement of goods"). As a contemporary concept employed in manufacturing and commerce, the idea of logistics was only recently introduced in China at the end of the last century. The new concept is defined by *The Council of Supply Chain Management Professionals (CSCMP)* (formerly *The Council of Logistics Management*) as "the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements" (CSCMP, 2006). For Chinese transport and logistics firms, their knowledge about the new concept of logistics will to a certain extent affect their choices of operational models and services for the purpose of conforming to shippers' demands. In this respect, the survey asked the respondent firms to express their opinions on the understanding of the logistics concept and the significance of providing logistics services by choosing one or more of the alternatives addressed by the questionnaire.

Sixty percent of the respondents thought of logistics as an entirely new organizational method and management technique for manufacturing and commerce industries, which could prolong the impact on the potential market of the logistics service providers (LSP). Furthermore, 23.15 percent deemed logistics to be a mixture of traditional transport services and value-added services, while another 16.85 percent insisted that logistics is multimodal transportation. Regarding the significance of providing logistics services to shippers, 93 percent of the companies were, in addition to transport, planning to develop a much broader extent of logistics services in the near future. Moreover, 70 percent indicated that providing logistics services to shippers is helpful for them too in terms of enhancing competitiveness, and 53 percent believed that developing logistics services is useful for the long-term growth of their companies.

According to these results, Chinese transport companies' perception of the new concept of logistics is increasingly expanding. This indicates that, thanks to energetic government support and extensive publicity, the majority of Chinese transport enterprises have developed sound knowledge about logistics, and most of them comprehend the significance and urgency of providing logistics services to meet customers' needs.

Enterprise characteristics

Several aspects of the profile and capabilities of the respondent transport logistics enterprises addressed in the questionnaire, such as regional distribution of business, type of cargo shipped, use of transport logistics information system (TLIS), and capability of providing value-added service, are reported as follows.

Regarding the regional distribution of business, as shown in Table 3-8, the majority of companies focus their business on the domestic market; a small part of the companies serve only the local market. Nevertheless, more than 30 percent of Chinese transport logistics

companies are providing international and cross-border (between China and Hong Kong, Macao, and Taiwan) logistics services.

Table 3-8: Regional distribution of economic activity

Marketplace	Percentage (%, multi-choice)
Local	14.0
Domestic	67.6
Cross-border (international/Hong Kong, Macao, and Taiwan)	31.2

Source: Author's calculations based on survey results

As to the types of cargo transported, containers remain the major type, accounting for 63.3 percent of the total; this is mainly due to the continually increasing level of containerization in Chinese transport sectors, which reached 65 percent for external trade cargoes in 2004 (China Merchants Information, 2004). The remaining types include high-value and time-sensitive cargoes, such as spare parts, telecommunication equipment, textiles and clothing, etc., those are shipped in bulk. The main types of cargo transported by the respondent transport logistics companies are shown in Figure 3-13.

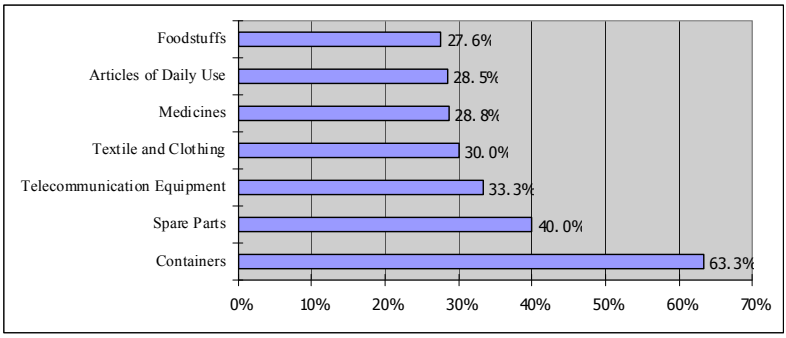

Figure 3-13: Main types of cargo transported by the respondent transport logistics companies
Source: Author's drawing based on survey results

Use of information technology in transport logistics

TLIS is an effective tool for modern transport logistics companies to administer and optimize their business operations and improve customer service. To this end, this survey addressed the use and functions of TLIS. According to the results, the majority (83.33 percent) of respondent enterprises have set up a TLIS. In TLIS, daily business transaction (scheduling, dispatching, fleet/driver management, etc) is one of the major functions; other functions include inquiry, long-distance communications, and decision-making and analysis, as shown in Figure 3-14.

For business transactions, Electronic Data Interchange (EDI) has become one of the most widely used systems and application software by Chinese logistics enterprises, according to a

survey conducted by National Development and Reform Commission (China Logistics Development Report, 2005). It is important to note that the rate of adoption of certain advanced information techniques and systems, such as Global Position System (GPS), Geographical Information System (GIS), bar coding, Radio Frequency Identification (RFID), Automated Sorting System (ASS), and Electronic Ordering System (EOS), has been gradually increasing among Chinese transport logistics companies, as shown in Figure 3-15. In this context, Chinese TLPs have realized the importance of advanced IT as a means to enhance service quality.

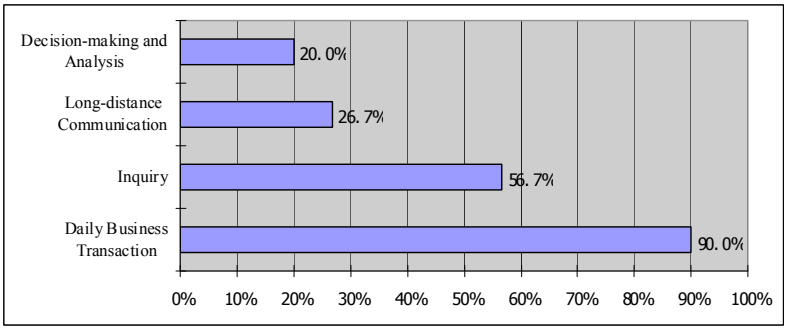

Figure 3-14: Main functions of Chinese TLIS

Source: Author's drawing based on survey results

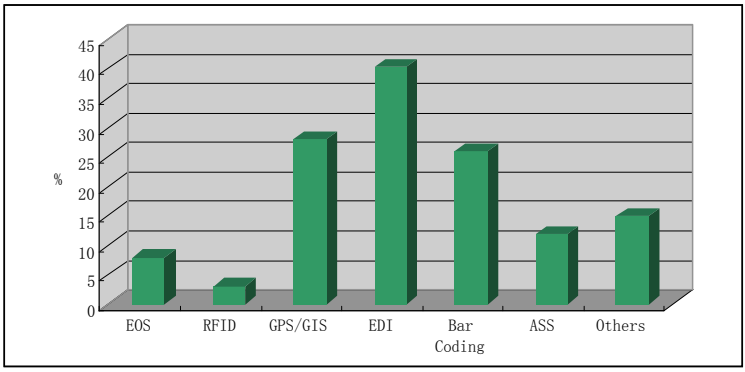

Figure 3-15: Main system and software used Chinese transport logistics companies' TLIS

Source: China Logistics Development Report, 2005

Capability of providing integrated and value-added logistics services

Providing integrated logistics solutions for customers is becoming an increasingly important capability for TLP to gain a competitive edge in the transport logistics market. Integrated logistics services comprise the entire supply chain management, including various logistics activities from transportation and freight forwarding, warehousing and distribution centre management to sophisticated forecasting, information management and other value-added

services, such as bulk breaking, consolidation, packaging, labelling, quality control, product assembly/installation, and customs clearance (Malaysian Industrial Development Authority, 2004). In this survey, an integrated logistics service (ILS) provider may not be defined as a logistics service provider (LSP) involved in all the mentioned logistics activities. However, they should undertake the following three principal activities: warehousing, transportation, and freight forwarding. In this respect, the majority of the respondent transport logistics companies deem that they have fairly strong capabilities to provide integrated and value-added logistics services. Among them, 66.67 percent believe that they possess the ability to provide customs clearance services, 80 percent think that they can provide a door-to-door service, and 66.67 percent are able to provide JIT services. Meanwhile, 60 percent think that they have the ability to provide equipment for handling over-length and heavy cargo, and 60 percent believe they can provide computerized systems for cargo tracking for shippers.

To prove that they are capable of providing ILS, most respondent companies mentioned that they have forged strong (contractual) links with the various players in transport logistics chains. Among these, 56.67 percent had signed long-term contracts with storage and warehousing companies, 53.33 percent had set up long-term contractual relationships with railway companies, 36.67 percent owned dedicated terminals, 60 percent had signed agreements with shipping lines, and 67 percent had established long-term relationships with shippers.

Utilization of facilities and equipment

According to the results of the survey, the average utilization of warehouses and transport vehicles reached 83.04 and 88.21 percent, respectively. The result of warehouse utilization is basically consistent with the investigation results addressed by CASW, as shown in Figure 3-16. The high utilization can be partly explained by the great demand for transport logistics services and the deficiency of logistics facilities, such as distribution centres and warehouses, especially well-equipped ones. Diversity in fleet size and capacity may be a contributing factor to variations in vehicle utilization. For instance, Chinese trucking companies have on average one truck and fewer than two employees; however, large operators typically have around 200 trucks (Clifford *et al.*, 2006). Nevertheless, it is urgent for the Chinese transport logistics sector to alter its unprofessional fleet management for the purpose of maximizing vehicle utilization, particularly in backhaul delivery.

Service attributes

In this survey, service attributes are described by “rate of damage or loss of cargo”, “quickness of response”, and “reliability of service”. With regard to the rate of damage or loss of cargo, 40 percent of companies fall below 1 percent. Another 40 percent are between 1 and 3 percent, and the remaining 20 percent rate between 3 and 5 percent. Quickness of response is indicated by the index “quickness of response to shipper complaints and claims” and “quickness of response to picking up cargoes from shippers”. To the complaints and claims of shippers, as shown in Table 3-9, 60 percent of the respondent companies could respond in less than 24 hours; only 6.67 percent required more than 72 hours.

As to the quickness of response to picking up cargoes from shippers, 60 percent of the respondent companies could pick up cargo in less than 24 hours; some companies (23.33 percent) could even receive cargo in less than 12 hours. The quickness of response to receiving cargoes from shippers by all respondent companies is shown in Table 3-10.

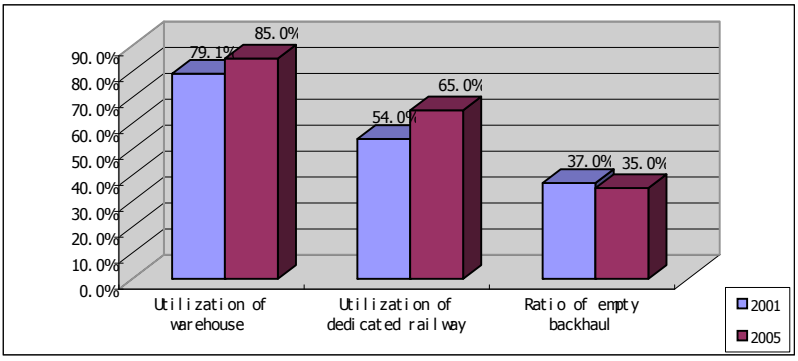

Figure 3-16: Utilization of facilities and equipment of Chinese LSP

Source: CASW, 2001, 2005

Table 3-9: Quickness of response to the complaints and claims of shippers by the respondent transport logistics companies

Quickness of response to the complaints and claims of shippers (hours)	Percentage (%)
24	60.00
48	20.00
72	13.33
More than 72	6.67

Source: Author's calculations based on survey results

The indicators "rate of punctuality of ships or trucks" and "proportion of errors in documentation" were also addressed in the survey to illustrate the reliability of services of transport logistics companies. As to the rate of punctuality of ships or trucks, 93.34 percent of the respondent companies hold that the rate of punctuality of their companies is above 90 percent; and 26.67 percent of these rates above 98 percent. Concerning the proportion of errors in documentation, as shown in Table 3-11, more than 90 percent of the companies are below 5 percent.

The survey demonstrates that improvements in service quality still has potential for Chinese TLPs. Actually, with the increasing demand for high-quality transport logistics services, Chinese TLPs have been making great efforts to enhance their service level. According to CASW, logistics service quality has seen important enhancements in the past five years, as shown in Figure 3-17.

Table 3-10: Quickness of response to picking up cargoes from shippers by the respondent transport logistics companies

Quickness of response to picking up cargoes from shippers	Percentage (%)
Less than 12 hours	23.33
Less than 24 hours	60.00
Less than 36 hours	16.67

Source: Author's calculations based on survey results

Table 3-11: Proportion of errors in documentation of the respondent transport logistics companies

The proportion of errors in documentation	Percentage (%)
Below 2%	60.00
2%-5%	33.33
5%-8%	6.67
Above 8%	0
Sum	100

Source: Author's calculations based on survey results

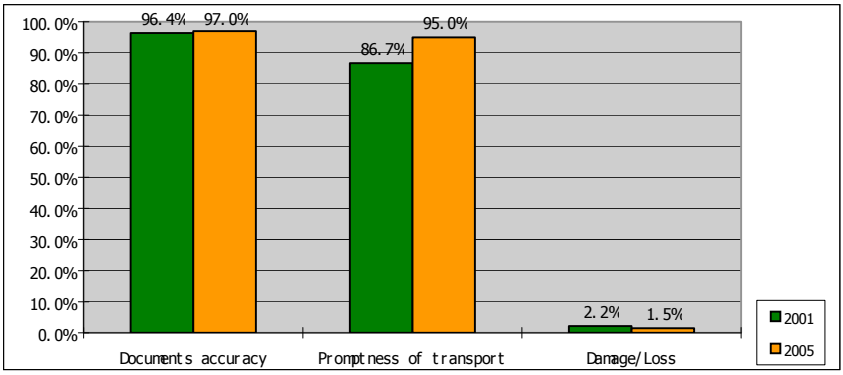

Figure 3-17: Logistics service quality of Chinese LSP

Source: CASW, 2001, 2005

Marketing strategy and policy

The marketing strategy and policy of transport logistics enterprises is reflected by a set of indices including "frequency of visiting shippers by salesperson", "quality of salesperson", "courtesy of salesperson to the customers", and "promotion method".

For Chinese transport logistics companies, salespersons' regular visits to customers and the building of long-term relationships and client loyalty through contracts/agreements with shippers have traditionally been the primary approaches to canvassing business (cargo).

According to the survey, the average frequency of salespersons' visits to shippers is 5.542 times per month. For some companies, the salesperson even visits the shipper daily. This shows that, within a more competitive marketplace, the consciousness of service quality and marketing of Chinese transport logistics enterprises have been obviously strengthening.

With regard to promotion methods, the majority of the respondents still utilize traditional methods such as holding negotiation meetings with shippers, distributing publicity materials, calling on customers, and advertising in newspapers and magazines. Over the past few years, the Internet has become a very important medium for advertising among Chinese transport logistics companies. The percentage of each method is shown in Table 3-12.

Table 3-12: Main types of promotion methods used by Chinese transport logistics companies

Promotion methods	Percentage (Multi-choice)
Internet	43.33
Newspaper	23.33
Magazine	26.67
Others (holding negotiation meetings with shippers, distributing publicity materials, calling on customers, etc.)	46.67

Source: Author's calculations based on survey results

Pricing policies and competition

China currently applies a mechanism of market-oriented pricing under macro-economic adjustment for products and services. There are presently three types of prices: government price, government guidance price and market-regulated price. The government price was set by price administration authorities and could not be changed without the approval of these authorities. Products and services subject to government pricing were those having a direct bearing on the national economy and the basic needs of the people's livelihood (such as food, edible oil and salt, power, fuel and telecommunication service, etc.), including all imported goods and those products that were scarce in China. With its state-owned status and monopolistic operation, China's railway transport (for both cargo and passengers) was subject to the government pricing mechanism. The government guidance price mechanism was a more flexible form of pricing. The price administration authorities stipulated either a basic price or floating ranges (generally 5 percent to 15 percent). Enterprises could, within the limits of the guidance and taking into account the market situation, make their own decisions on prices. Water transport for cargoes having a significant effect on the national economy (such as coal, oil etc.) was such a case. Air freight prices were also regulated similarly. Meanwhile, passenger transport by all modes was always subject to the government guidance price based on seasonal demand. With market-regulated prices, enterprises were free to set prices in accordance with supply and demand to the extent permitted by generally applicable laws, regulations and policies concerning prices (CABC, 2005). The operators in Chinese freight transport logistics market (especially deep-sea and road transport market) were free to set prices based on market fluctuations and competition strategies.

Along with its entry into the WTO, China's transport logistics market has become much more open after phasing in all of the related WTO commitments. From a theoretical perspective, pricing matters in a liberal economic environment ought to be, ideally, left to the producers (service providers) themselves. In this respect, according to this survey, most Chinese transport logistics companies (86.67%) adopted comparatively flexible pricing policies to meet competitors' prices. At the same time, 70% of companies stated that they would not adopt a low price policy. However, because of market immaturity and the narrow range of service areas, numerous Chinese transport logistics companies, medium and small-sized companies in particular, have to adopt cost-oriented strategies with low cost and low profit for market competition (Wang et al, 2006; CFLP, 2006).

Low cost strategies, together with intense competition and deficient market surveillance has resulted in the disorder of Chinese logistics market. For instance, in the road freight transport market, over-loading is common and serious. As such, illegal modifications made to vehicles to increase their capacity are rife. Competition, regional differences in taxation, and tax avoidance result in different cost structures. The low efficiency of transport; over capacity; fierce competition; and low transport prices result in the impossibility of gaining profit without over-loading. Under these circumstances, it is normal for an 8-ton load vehicle to carry 20, even 30 tons of goods (CFLP, 2006). In shipping, because of over-capacity, competition on freight rates is fierce; there even exit situations of pricing below costs. Illegal ships without certificates, ships with license of less than loading capacity, illegal freight forwarders and shipbrokers exist in the market. Especially, the competition between state-owned and private shipping companies is not fair due to the private companies' flexible pricing policy and "Grey Market" operations. Competition in the Chinese transport logistics market is discussed in detail in Section 3.4.

Barriers to the future development of Chinese transport logistics

In this survey, respondent companies were asked to give their perceptions on barriers to the future development of Chinese transport logistics industry. As shown in Table 3-13, the most serious barrier is the lack of qualified human resources, which is consistent with the survey result addressed by Wang *et al*. (2006). Other barriers include segmented administrative regime, deficiency of transport logistics infrastructure, underdeveloped outsourcing market, incomplete regulations, and regional protectionism. While other barriers commonly relate to transitional economies, segmented administrative regime requires special emphasis. Currently, each transport mode (railway, airway, road, and waterway) in China is overseen by different government authorities; no government agency is involved in the entire transport logistics chain (Hong *et al.*, 2004). This regime has seriously affected the development of integrated logistics services. This is also the cause of problems in infrastructure provisions, regulations, and market supervision within the Chinese transport logistics sector.

3.3.3 Summary and analysis of the survey

Taking the utilization of warehouses, the utilization of transport vehicles, the frequency of visiting shippers, and the proportion of building long-term contractual relationships with

shippers as examples, a statistical analysis for the sample data was conducted. The resulting mean, standard deviation, and confidence interval at the of 5 percent significance level are shown as Table 3-14.

Table 3-13: Main barriers hindering the development of Chinese transport logistics

Rank	Type of Barriers	Percentage (multi-choices)
1	Lack of qualified logistics human resource	60.00
2	Segmented administrative regime	50.00
3	Deficiency of transport logistics infrastructure	40.00
3	Underdeveloped outsourcing market	40.00
4	Incomplete regulations	30.00
5	Market monitoring and control	13.33
6	Restrictions from local government and regional protectionism	10.00

Source: Author's calculations based on survey results

It is worth noting that the selected indicators have relatively higher standard deviations, which could be due to the fact that the range, level, and capability of service of transport logistics providers differ in various locations and between companies with different managerial ability and efficiency. For instance, in cities such as Beijing, Shanghai, Shenzhen, and Guangzhou, more joint ventures and foreign TLPs, which enjoy higher reputation in efficient management, are available to serve the larger populations of foreign firms investing there (these are the more popular cities for foreign investment). However, for inland TLPs, the indicators reflecting the service level should be much lower than their counterparts in the important logistics centres and coastal cities.

Table 3-14: Statistical analysis for selected indicators

	Mean	Standard deviation	Significance level	Confidence Interval	Confidence
Utilization of warehouses (%)	83.042	12.967	95%	(77.85, 88.23)	5.188
Utilization of transport vehicles (%)	88.208	12.194	95%	(83.329, 93.087)	4.879
Frequency of visiting shippers (times per month)	5.542	7.125	95%	(2.692, 8.392)	2.850
Proportion of building long-term contractual relationships with shippers (%)	67.000	19.856	95%	(59.056, 74.944)	7.944

Source: Author's calculations and drawing based on survey results

3.4 Competition in the Chinese transport logistics market

Before China's entry into WTO in 2001, Chinese transport logistics service providers (TLSPs) provided only basic transport and warehousing services within fragmented, tiered, and rigid top-down state-monopolized logistics/distribution networks. Due to the central government gradually delegating more approval power to regional authorities, local protectionism emerged and is still, as mentioned in the survey results of the previous section, a major barrier to the efficient flow of goods (Bassolino & Leow, 2006). In recent years, however, China's logistics/distribution market is maturing rapidly. In accordance with China's WTO accession commitments, the Chinese transport logistics market is now open to wholly owned foreign enterprises, helping the Chinese logistics system progress towards a free market mode. Overseas players no longer need to work with a local joint venture partner and thus most of them now have a presence in mainland China (Hong et al, 2004). To this end, competition between foreign firms and their Chinese counterparts (state-owned and private), which now need to provide efficient and high-quality services to survive, is becoming fiercer.

3.4.1 Market players

As a result of economic growth, transport logistics users in China place more emphasis on service quality and demand new services. In this sense, it is critical for China's transport logistics providers, that are cost-driven, in the coming years to transform into service-oriented providers (Wang et al, 2006). Along with deregulating logistics markets, entry into the WTO has resulted in the emergence of logistics giants, such as UPS, Fedex, and DHL. According to China's WTO commitments, within four years of WTO entry, foreign companies are allowed to own 100 percent of Chinese freight forwarding, third-party logistics and customs brokerage firms, as opposed to roughly 50 percent before. They are allowed to fully own trucking companies within three years of WTO entry and rail services within six years. Domestic express and air parcel services, which are historically government monopolies, are opened to 100 percent foreign ownership within four years of WTO entry. As these large international companies possess tremendous advantages in capital, technology, and operational experience, it is very tough for China's local logistics providers to compete with them if they do not have innovative services that are of high service quality (Wang et al, 2006).

In general, today's aspiring players in Chinese transport logistics sector include state-owned enterprises (SOEs), local or joint-venture third-party logistics firms, foreign transport logistics groups and new domestic players emerging from domestic manufacturing and distribution (McKINSEY & Co, 2001).

From the perspective of company origin, apart from emerging private logistics companies who are relatively new to the logistics business, transport logistics services providers (TLSPs) can be grouped in three main categories.

The first type of TLSP consists of transport companies and forwarders. By extending their service scopes to supply comprehensive logistics services, transport companies and forwarders are becoming very important TLSPs in Chinese logistics market, especially the

large-sized transport enterprises, such as COSCO, Sino-trans, China Railway United Logistics Co. Ltd., China Post Logistics Co. Ltd. and China Shipping. In addition, some small and medium-sized enterprises (SMEs), especially road transport enterprises make full use of their advantages in flexibility to provide door-to-door transport and logistics services.

The second type of TLSP comprises in-house logistics providers affiliated with commercial enterprises, i.e. retailers and wholesalers, especially some dominants in Chinese supermarket and chain stores, like Shanghai-based Lianhua Chain Stores, and Beijing-based Nonggongshang Chain Stores. The affiliated TLSPs have accumulated plenty of successful experiences in logistics and distribution practice. Through making use of their advantages in densely covered purchasing and sale network and distribution channels, and furnishing transport and warehousing facilities, they mainly supply in-house logistics and distribution services. Occasionally they serve other retailers, aiming at decreasing total cost and improving customer service for their parent firms. Due to their efficient delivery networks, in-house logistics providers have been developing very rapidly over the past few years, helping their parent commercial enterprises survive in fiercer competition with foreign retail giants, such as Wal-Mart, Carrefour, Metro, etc.

The third type of TLSP involves logistics and distribution centers based in coastal ports and inland hubs. Stevedoring companies, warehousing and storage companies, normally constitute the main parts of this type of TLSP. The logistics center has advanced facilities (warehouses, CFS, depots, etc) and infrastructure; usually there are also a lot of transport (road/rail) companies and forwarders in the logistics centers. Leveraging the facilities and the stationed logistics companies, this type of TLSP is capable of providing comprehensive logistics services according to the requirements of customers.

Despite the number and types of TLSPs in China, the need for integrated logistics services is not easy to meet since very few TLSPs can offer a truely nationwide service. According to China Economic Review (2007), currently there are more than 700,000 logistics enterprises registered in China, mostly small and medium-sized operators. Even the largest logistics providers have less than 2% market share. Most of them tend to operate on a local or regional level, which means that supply chains must rely on multiple service providers. For instance, Wal-mart China requires 15,000 suppliers to service its 60 or so stores, as compared with Wal-mart US, which services 3,800 stores with only 61,000 logistics suppliers (China Economic Review, 2007).

3.4.2 Competition level

The range and scale of logistics functions are large. Therefore, the elements of a logistics service may be understood in different ways. The difference may be a result of different types of business and processes (Heaver, 2002). In this respect, different LSPs get involved in different market segments according to their expertise, size, and resources. Depending on whether they offer services or solutions to customers, or if they provide value-added or basic logistics, TLSP/3PLs can be divided into four market segments (Berglund et al, 1999), as shown in Figure 3-18. Here, services mean that TLSPs mainly focus on a few standard

services, for example distribution of spare parts, and use scale economies to increase profits, while solutions mean that TLSPs mainly focus on a few industries, take over complete, well-defined processes and customize their services. (Berglund et al, 1999)

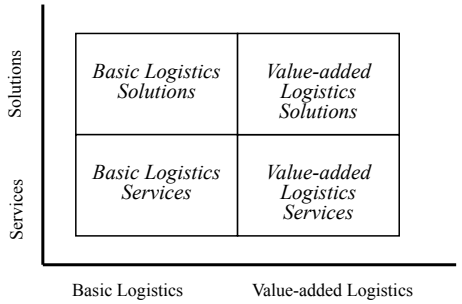

Figure 3-18: Logistics market segments
Source: Berglund et al, 1999, adapted

Consequently, the competitive situation in transport logistics presents a diversified picture. This means that logistics enterprises with different capabilities face different levels of customers; market differentiation is thus very clear. Competition between LSPs can be categorized by the following three levels (Figure 3-19).

High level competition
Targeting major customers and big logistics project/solutions, LSPs in this level focus mostly on integrated (door-to-door) logistics. Competition in this level is relatively strong. The major means of competition are IT-based management systems, and high quality custom-tailored services.

Most large foreign logistics enterprises do not have their own “hard” logistics resource. They compete on the basis of their strong “soft” resources, such as IT-based management systems, accumulated reputation, integration technology and experience in logistics management. In order to deliver integrated logistics services/solutions they normally rent warehouses, vehicle fleet, and other facilities and equipment, or contract out some easy logistics operations (functions) to profit from cost differences. For LSPs that focus on solutions, a vertical or horizontal integration strategy is often adopted to create value (Berglund et al, 1999).

In contrast to their foreign rivals, large state-owned logistics enterprises have huge assets and comprehensive logistics networks. Most of them own the vehicle fleet and warehouses. However, there are big gaps in qualified transport logistics talent and management systems and information technology, compared with their foreign rivals. Among these large state-owned logistics enterprises, COSCO Logistics is a model. As one of the largest 3rd party logistics companies in China, it possesses abundant facilities and equipment and strong comprehensive strength covering all around logistics service fields. Based on the basic

business including shipping agency, freight forwarding and multimodal transport, COSCO Logistics strategically focuses on the development of product logistics such as automobile logistics, chemical logistics and exhibits logistics, and also places its development emphasis on project logistics such as power logistics and petrochemical logistics. Currently, COSCO Logistics has formed its specific feature and the leading position in the industry especially in fields such as heavy haulage, chemical logistics and distribution.

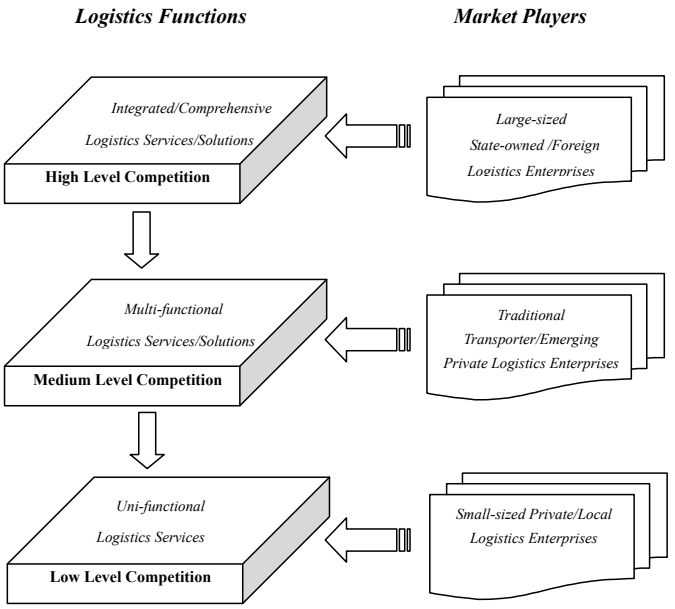

Figure 3-19: Framework for competition level

Source: Author

Medium level competition

Logistics enterprises that belong to this level mostly used to be traditional transport enterprises, and freight forwarders. There are also some new emerging private logistics enterprises like P. G. Logistics Group Co., Ltd., South Logistics Corporation, Tianjin Datian Group Co., Ltd., Beijing ZJS Express Co., Ltd., Yuancheng Group Co., Ltd., and Hoau Logistics Co., Ltd. belonging to this level. Private logistics enterprises are presenting a trend of swift and rampant development. As most of these enterprises are born from freight forwarders, they are familiar with the transport logistics business and correspondingly have qualified professionals, although they normally do not have their own logistics assets and facilities.

In this respect, LSPs in this level mostly focus their multi-functional logistics services on the

multimodal container transportation and freight forwarding. They are also involved in some value-added logistics functions such as customs brokerage, commodity inspection, warehousing, bonded logistics and insurance. Joint ventures and foreign companies who have special fondness for outsourcing logistics functions are the major customers of the LSPs in this level.

In the face of large-scale entry and expansion of foreign logistics enterprises, Chinese logistics enterprises have readjusted their strategies in response to these challenges. As a result, several domestic logistics companies, in particular private enterprises such as P. G. Logistics, Hoau Logistics, and Kerry Logistics, are playing an important role in Chinese transport logistics. These companies have comprehensive domestic networks, low cost and good logistics practices. Nonetheless, information systems is always a bottleneck facing them.

Over the past few years, driven by the prosperous domestic trade in agriculture products (grain, fruit, etc.) and chemicals, China has seen a rapid growth in domestic coastal and inland container shipping. Xinliang Marine Ltd., and South Logistics Corporation are the leading companies in this market. As water container transportation has an irreplaceable advantage in terms of price and quality, these companies are dominating this market segment. Also, these companies are gradually transferring their position to LSPs by fully controlling vehicles and other equipment/facilities through contracts. At present, there are only a few competitors in this market segment.

Low level competition
Companies involved in this level are mostly dealing with basic and simple logistics operations. The size of most of these companies is relatively small. However, they own vehicle fleets or warehouses. Their profit comes from basic logistics services, such as trucking, pickup and delivery. When large or medium logistics enterprises do not have enough transportation capacity, or lack a network in some areas for some projects, they may outsource part of the simpler transportation or storage operations to these small companies while they still supervise the whole procedure. These small companies have a rather weak service culture. As a result, the phenomenon of damaging and losing goods often happens. Meanwhile, due to lack of information network and capability of tracking and tracing , the required arrival times of goods is often not met.

Competition at this level is fierce, especially on price. Some very small local private transport logistics companies often compete on price, even below cost. To maximize profit, trucks are often overloaded.

3.4.3 Emerging trends in competition
The opening-up of Chinese transport logistics market provides opportunities for multinational logistics companies. They are taking up a large share in China's logistics market. For instance, at present MNCs possess most of the market share in the Chinese warehousing market, while domestic players only cover around 3% (CFLP, 2006). However, with resource integration, optimization and consolidation, Chinese logistics enterprises will further enhance their

competitiveness. Competition tends to be more intensive in China's logistics market.

Demand for logistics services tends towards high quality and subdivision
With the strengthening and restructuring of logistics operations in manufacturing and distribution enterprises, the level of demand is rising continually. The most direct feature of the rising level of demand is that the basis of choice of TLSP is gradually being upgraded from capabilities and prices to quality considerations such as speed, reliability, security, stability and especially the credit status of TLSP.

China's logistics market is being subdivided into more segments, which not only include common sectors such as finished products and parts distribution for manufacture, Fast Moving Consumer Goods (FMCG) distribution for commercial firms, and express delivery for high value and time-sensitive cargo, but also include newly emerging logistics sectors such as seed and fertilizer distribution for agriculture, cold chain logistics for perishable cargo (seafood, vegetable, fruit, etc), pharmaceutical logistics, hazardous materials and reverse logistics.

Competitive environment is becoming tough
A mature transport logistics market will gradually emerge to match the quick developments in standards and quality demand. However, very few market players, especially domestic logistics companies, are able to provide a comprehensive logistics service.

The competitive environment is becoming tough with the wider opening-up of China's logistics and distribution system in accordance with the promises of China's entry into WTO. Foreign logistics enterprises will play a greater role due to their rich experience and good reputation. State-owned enterprises will likely lose market share. Normally, foreign firms have also a large number of international customers . With the easing of restrictions in the logistics and distribution market, their international customers, often in joint ventures and/or sole-ownership of companies in China, are now requiring the foreign logistics enterprises to take control of their logistics services, which are provided by the state-owned transport logistics enterprises. For instance, the importing logistics of Shanghai Volkswagen used to be controlled by COSCO Logistics. Now, the German investor requires a German logistics company to take control of the whole logistics chain. Moreover, to increase market control, foreign logistics enterprises have been readjusting their strategies on mergers and acquisitions of Chinese logistics companies to shape up solely owned or controlled companies: Singaporean Keppel T & T invested in Annto Logistics Co. Ltd., United Parcel Service of America, Inc. (UPS) paid a price of US$100 million to reach an agreement with Sinotrans on their splitting, and TNT, a multinational logistics service provider from The Netherlands, purchased Hoau Logistics Group (China Economic Net, March 2007).

The tough competitive scenario can be also seen in express delivery services, which is currently dominated by foreign competitors. According to China Federation of Logistics and Purchasing (2007), 80 percent of China's overseas express mail services are provided by four foreign logistics giants -- FedEx and UPS of the United States, Germany-based DHL and

Dutch TNT. Nearly 98 percent of the clients of the four foreign giants in China were joint ventures or wholly-owned foreign companies. Importantly, domestic competitors will find it hard to break their foreign counterparts' domination in the short term.

In a competitive environment, domestic players may have to start offering logistics services through vertical or horizontal integration. Actually, traditional state-owned logistics companies like China Post, COSCO Logistics, Sinotrans, etc. have already been active in integration strategies, such as alliances M&As, since 2000. A number of private firms including Guangzhou-based P.G. Logistics and South Logistics and Beijing-based Zhaijisong Distribution have emerged and are expanding rapidly. The operational model and strategy of Chinese transport logistics is further discussed in the next chapter.

Competition in the highly profitable distribution sector will become fiercer
Most of the logistics enterprises have recognized the high profit margins of distribution services for chemical products (hazardous cargoes), electronics, and automotive and spare parts. As a result, the highly profitable logistics sectors have been targeted by almost all large-sized logistics enterprises. However, the requirements and capability of providing logistics services in these sectors are very high. For example, special equipment and facilities are required for transportation of hazardous cargoes due to safety requirements. Also, the initial investment for starting-up a logistics operation in these sectors is much higher than in traditional transport logistics operations. In this respect, only a few large-sized transport logistics companies such as COSCO Logistics, China Shipping Logistics, Maersk Logistics, etc. are currently entering these sectors. However, with the expediting steps of large-sized multinational logistics companies into China's transport logistics market, competition is expected to be fairly fierce in the future.

3.5 Conclusions

The aim of this research is to define the constitution of ACTL conforming to the reality and environment of Chinese transport logistics. In this respect, state-of-the-art Chinese transport logistics market structures (supply/demand and competitiveness) have been reviewed based on typical on-the-spot investigation, questionnaires, expert advice, and comparative analyses of foreign countries' transport logistics characteristics.

The demand for Chinese transportation logistics is characterized by four aspects. First, compared with developed countries, Chinese enterprises are reluctant to outsource their logistics activities; no signs indicate a spectacular increase in the willingness to operate their logistics services externally. The lack of awareness of the concept and importance of logistics is the main factor hindering the willingness of outsourcing. Other factors include:

- traditional thinking of "self-reliance" and inefficient enterprise management on shippers' side;
- low-level service quality and high operational costs on TLPs' side;
- unfavourable logistics circumstances, such as segregated administration regimes; and

- comparatively low degree of commercialization, diversification, and specialization.

The second feature of China's transport logistics demand concerns the logistics functions outsourced, which are now transformed from quantity-oriented to quality-oriented services, diversity and individuality. The third feature creates a state of disequilibrium between China's eastern coastal area and its central and western areas; coastal regions have grown rapidly, benefitting from logistical accessibility and well-developed infrastructure, while interior areas have fallen behind. The last feature concerns market segmentation.

Based on the results of the questionnaire survey of nationwide transport logistics enterprises led by the author, the characteristics of Chinese transport logistics providers can be summarized in accordance with the following aspects:

- knowledge about the concept of logistics;
- enterprise characteristics;
- use of information technology for transport logistics operations;
- capability of providing integrated and value-added logistics services;
- utilization of facilities and equipment;
- service attributes;
- marketing strategy and policy; and
- barriers to the future development of Chinese transport logistics.

According to the survey, the perception of Chinese transport companies regarding the new concept of logistics is increasingly expanding. As such, with the energetic support of the government and extensive publicity, the majority of Chinese transport enterprises have developed a sound knowledge of logistics, and most Chinese transport companies have perceived the significance and urgency of providing logistics services to meet customer needs.

Regarding pricing policy and competition, the operators in Chinese freight transport logistics (especially deep-sea and road transport markets) are free to set prices based on market fluctuation and competition strategies. Although 70% of respondent companies stated that they do not adopt a low price policy, numerous companies, medium and small-sized ones in particular, have actually adopted cost-oriented strategies, of low cost and low profit, for market competition because of market immaturity and the narrow range of service areas. Along with more deregulation, entry into the WTO has resulted in the arrival of foreign logistics giants. As these large international companies possess tremendous advantages of capital, technology, and operational experience, it is very tough for China's local logistics providers to compete with them if they do not have innovative services that are of high service quality.

The statistical analysis of the survey identified selected indicators with relatively higher standard deviations. This could be due to the fact that the range, level, and capability of service of transport logistics providers differ in various locations and between companies with different managerial ability and efficiency.

Chapter 4 Building a Sustainable Intermodal Transport Chain in China

Intermodality is regarded as a key to sustainable logistics chains, able to change policymaking, businesses and behavioural patterns and create a competitive advantage for the intermodal transport industry (EIA 2006). In this context, quality intermodal transport logistics is a critical aspect to be taken into account for restructuring the architecture of Chinese transport logistics (ACTL). For the requirements of a sustainable intermodal shift, among others, European policy makers and researchers are becoming concerned about the initiative of decoupling economic activity from transport activity in order to reduce congestion and other negative side effects of transport (Gilbert *et al.*, 2002). This chapter aims to examine whether the EU initiative is meaningful and feasible in the context of freight transport in China as well as explore a strategy for encouraging a modal shift from less sustainable modes of transport—particularly road transport—to environmentally friendly modes, such as rail and water (coastal and inland waterways) transport while maintaining economic growth (Yang, J., 2008).

4.1 Introduction: towards sustainable intermodal transport logistics

With globalization and the increasing need for competitiveness, the ability of countries to improve the logistical quality and reduce transaction costs through the provision of adequate and efficient intermodal transport systems is more critical than ever. Intermodalism is increasingly at the core of most advanced logistics strategies used by the major transport companies in the world (OECD, 2001). According to European Parliament (2007), intermodal transport is defined as "a transport system whereby at least two different modes are used in an integrated manner in order to complete a door-to-door transport sequence". The intermodal concept is therefore an integral part of the global logistics chain concept. In this regard, intermodalism does not seek to impose any choice whatsoever as to a specific mode of transport. Instead, by improving the connections between all modes of transport and by integrating them in a system, its aim is to help optimise the system as a whole, and to seek to optimise a global logistics chain which is not necessarily the result of each mode of transport optimised individually, by relying on efficient information and communication services (EIA, 2006). In this context, a priority is to integrate the more environmentally-friendly modes of transport – rail, inland waterway transport and short sea shipping – into the transport chain more effectively (European Parliament, 2007).

With its fast growth, China is striving for a national strategy that focuses on enhancing "social harmonization", in which harmonization between economic development and the human and natural environment is one of the important initiatives. Transport, including freight transport, is increasingly related to environmental harm and land use (Meersman *et al.*, 2003). Almost a quarter of all manmade carbon dioxide (CO_2) emissions in Europe were transport related in 2003, and 84 percent of emissions from transport were caused by road transport in 1998

(Kveiborg *et al.*, 2007). Considering that transport in China—particularly road transport—has been causing significant societal problems, including congestion, air pollution, noise, land use, and safety issues/accidents, building a sustainable transport system will play a pivotal role in the implementation of the national strategy (CPC, 2005). Meanwhile, along with China's emergence as a global manufacturing centre, China is impressively reshaping its logistics channels that are getting more global. In order to meet its international customers' demand for integrated logistics services, China needs to restructure its transport system through encouraging a modal shift from less sustainable modes of transport—particularly road transport—to environmentally friendly modes, such as rail and water (coastal and inland waterways) transport while maintaining logistical quality and economic growth.

Demand for freight transport is a derived demand that is dependent on the demand for other goods and services and has historically followed similar trends with the growth of economic activities (Kveiborg *et al.*, 2007). Indeed, the ongoing growth of the economy and external trade of China are stimulating the demand for transport logistics and the expansion of China's transport and logistics sector. The total freight volume in China has soared over the last decades. From 1978 to 2004, freight transport increased more than six-fold, from 2.5 billion tonnes to 16.7 billion tonnes. Growth in terms of tonne-km has been equally impressive, leaping from slightly less than 1 trillion to 6.7 trillion tonne-km (NBS, 2005). Most analysts estimate that China's rate of economic growth during the next decade will average around 7 percent annually (A.Gezen, 2005). As the historical trends continue, 2010 will see a commensurate growth of freight transport in China, as shown in Table 4-1.

Table 4-1: China's freight transport by 2010

Mode	Unit	2005	2010	% change
Road transport	Tonnes (billion)	13.4	16.0	19.4
	Tonne-km (trillion)	0.87	1.20	37.9
Water transport	Tonnes (billion)	2.2	2.9	31.8
	Tonne-km (trillion)	4.97	6.60	32.8
Rail transport	Tonnes (billion)	2.70	3.50	29.6
	Tonne-km (trillion)	2.07	2.70	30.4

Source: The 11th Five-year Plan of Transport in China, MOC1 & MOR, 2005

The derived nature of freight transport implies that, if no purposeful measures are taken, an increase in industrial production and growing international trade will inevitably lead to greater demand for transport services. For the necessary integration of transport issues into a sustainable development policy, breaking the link between freight transport and economic activities ("decoupling") has become an important consideration for transport policy makers

in Europe. The decoupling of road transport growth and economic growth can be observed in several European countries (Kveiborg *et al.*, 2007), where "weak decoupling" of all the three aspects (freight, passenger and CO_2) could be seen in the UK, Sweden and Finland in the 1990s (Tapio, 2005). The European Commission believes that decoupling transport growth from economic growth will allow the EU to attain a new modal equilibrium (Meersman *et al.*, 2003).

In line with the implementation of a sustainable intermodality strategy in China, this research will assess the relationship between freight transport and economic activities in China and examine the possible factors affecting the relationship between the transport demand and the development of Chinese economy. In particular, the appropriate government intervention and policy instruments will be discussed for building a new era of sustainable intermodal transport logistics in China, which will be an important contribution to the national strategy of "social harmonization".

4.2 Literature review

For the requirement of the sustainable intermodal shift, among others, European policy makers and researchers are becoming concerned about decoupling economic activity from transport activity (Gilbert *et al.*, 2002). The initiative of significantly decoupling transport growth from economic growth in order to reduce congestion and other negative side effects of transport was first proposed in the Transport & Environment (T&E) integration strategy adopted by the Council ministers in Helsinki (EEA, 2004). Since then, reducing the link between transport growth and economic activity has become a central theme in EU transport policy, in an effort to reduce the negative impacts of transport. In academic discourse too, policy instruments towards a sustainable intermodal shift have been proposed and examined both inside and outside Europe.

4.2.1 Measuring decoupling of freight transport from economic activity

Although there is broad agreement on the concept of decoupling, which aims to weaken the link between transport activity and economic activity, a consistent method of measuring decoupling has yet to be developed (Ballingall *et al.*, 2003). In light of New Zealand's governmental vision for the development of a national transport system by 2010, outlined in the New Zealand Transport Strategy (NZTS), the overall goal is to achieve an affordable, integrated, safe, responsive, and sustainable transport system. Ballingall *et al.* (2003) argue that decoupling is not solely an economic objective; therefore, the assessment of any decoupling policies must take into account their potential impacts on social factors such as mobility and equity. In this respect, they propose a ratio between welfare and transport measures to examine whether decoupling has occurred in the past as well as to monitor future changes.

$$\textit{Decoupling ratio} = \textit{MMM/Triple bottom line GDP} \quad (1)$$

Here, 'Triple bottom line' GDP is an adjusted GDP measure of welfare that consists of economic, environmental and social aspects. 'MMM' indicates a measure of mass movement for the transport involved in moving people and goods. MMM is a volume measure that takes into account both the distance and weight of freight movements (tonne-km) or the distance and number of passenger movements (person-km).

Tapio (2003) assumes that decoupling can be expressed as elasticity values of less than 1, where the percentage change in freight transport volume (tonne-km or vehicle-km) is divided by the percentage change in economic indicators such as GDP, industrial production, retail, and external (import and export) trade in a given time period which should comprise 5–10 years, as there is supposedly a lag in the changes of economic growth rate to consumption (Tapio, 2005). In their study, Kveiborg *et al.* (2007) used industry production values instead of GDP as the economic measure, since the whole product is transported, not just the part that is added by the industry. Nevertheless, GDP is still one of the commonly used and most widely available economic measures as it provides a way of comparing economic activity in different countries. However, this measure has a number of limitations when considering issues of welfare or sustainability (Stead, 2001). In this regard, this research uses GDP, together with retail, and imports and exports as the economic measure.

Using GDP as an example, the elasticity of freight transport demand wrt GDP can be expressed by (Tapio, 2003):

$$\textit{Transport elasticity of GDP} = \%\Delta VOL / \%\Delta GDP \tag{2}$$

From an environmental perspective, decoupling of transport CO_2 emissions from transport volume can be measured by:

$$\textit{Transport elasticity of } CO_2 \textit{ emissions} = \%\,\Delta CO_2 / \%\Delta VOL \tag{3}$$

And/or

$$\textit{GDP elasticity of transport } CO_2 = \%\Delta GDP / \%\Delta CO_2 \tag{4}$$

Meersman *et al.* (2003) proposed a multiple regression model to describe the relationship between the proportional change in tkm (total and for the various modes) on the one hand and the proportional change in GDP, industrial production (IP), imports and exports, retail, etc. on the other hand:

$$\frac{\Delta \text{tkm}}{\text{tkm}} = \beta_0 + \beta_1 \frac{\Delta \text{GDP}}{\text{GDP}} + \beta_2 \frac{\Delta \text{IP}}{\text{IP}} + \beta_3 \frac{\Delta \text{IMPORT}}{\text{IMPORT}} + \beta_4 \frac{\Delta \text{EXPORT}}{\text{EXPORT}} + \text{u} \tag{5}$$

Here, the coefficients β_1, β_2, β_3 and β_4 are the short-term elasticities of freight transport demand with regard to the economic activity measured in terms of GDP, industrial production (IP), and imports and exports respectively. Based on the elasticities, the impact of economic activity on freight transport can be evaluated.

Tapio (2003) proposed the terms *strong decoupling* and *weak decoupling*, in which strong decoupling can be expressed as the environmental variable (e.g., CO_2 emissions) decreasing in absolute terms and weak decoupling as the environmental variable decreasing relatively to the corresponding activity variable (e.g., transport volume) but still increasing in absolute terms.

In addition, the transport intensity of GDP (the ratio of tonne-km or vehicle-km to GDP) is also often used as a measure of decoupling the growth of transport and economic activity (e.g., Gilbert *et al.*, 2002; Tight *et al.*, 2004; Ballingall *et al.*, 2003; McKinnon, 2007). By this ratio, the amount of transport activity associated with each unit of Gross Domestic product (GDP) may be measured (Gilbert *et al.*, 2002).

4.2.2 Causal relationship between transport growth and economic growth

A number of works to date have focused on the link between transport growth and economic growth while decoupling has been done in Europe (Tight *et al.*, 2004). Meersman *et al.* (2003) explore whether such decoupling is at all feasible in the context of freight transport within and between ECMT-countries. They argue that the EU-initiated decoupling can only be interpreted as an attempt to break the automatism, whereby absolute growth in freight transport is always greater than economic growth and whereby the market share of road haulage in particular continues to rise. In this respect, they conclude that the decoupling of demand for freight transport entirely from economic activity and international trade is not feasible. However, more balanced, more efficient, and less burdensome freight transport operations can be attained by full implementation of the package of measures proposed in the White Paper by the European Commission (2001) without risking more bottlenecks of transport or undermining anticipated economic growth.

McKinnon (2007) examined 12 possible causes of the observed decoupling in the UK and argued that 7 factors appear to have significant effect on decoupling: the increased penetration of the British road haulage market by foreign operators, a decline in road transport share of the freight market, real increases in road freight rates, changes in the composition of gross domestic product, diminishing rates of spatial concentration, domestic supply chains becoming fully extended, and erosion of industrial activity to other countries. He concluded that the recent decline in the road tonne-km intensity of the UK economy will need to be reinforced by further reductions in empty running, higher vehicle load factors, improvements in fuel efficiency, tightened emission controls, and a continuing modal shift to rail and water for the coming new era of sustainable logistics.

As one of two (UK and Finland) countries that have escaped the huge growth in transit traffic in the EU (McKinnon, 2007) and a best practice example of policies for sustainable mobility, the decoupling of freight transport and GDP growth in Finland is discussed by Tapio (2005). His research presents the developments of the relationships among GDP, road traffic volume, and carbon dioxide emissions from road traffic in Finland from 1996 to 2001. He also examines the reasons behind the development and policies towards sustainable mobility, which are policy for sustainable mobility, green urban lifestyle, and increasing income

differences, etc.

Kveiborg *et al.* (2007) discovered that the observed decoupling of road freight traffic growth from economic growth in Denmark is mainly the result of the use of larger vehicles, increased average loads, and less empty running.

While the decoupling of transport growth and economic growth is of concern in Europe, relative little interest can be found outside the European continent (Gilbert *et al.*, 2002; Ballingall *et al.*, 2003). On the other side of the Atlantic, Gilbert *et al.* (2002) argue that as a European concept, decoupling has not emerged as an objective policy in North America or even as a matter of academic discourse. They hold that the prevalent view of decoupling in North America is that good transport, especially good freight transport, is essential for economic development; reducing the adverse impacts of transport is certainly desirable, but transport activity must continue (surly, together with good transport efficiency). Based on their analysis and explanation of the differences between Europe and North America, they deem that the modest decoupling in the US represents insufficient progress towards sustainability. To this end, the achievement of sufficient decoupling, to ensure attainment of sustainable transportation, will require the application of a range of fiscal and regulatory instruments such as dematerialization of the economy, optimization of transport organization, and policies of market incentives and lifestyles, etc.

Similarly, Ballingall *et al.* (2003) argue that decoupling has received little attention in New Zealand and Australia. Their study examines some possible measures of the relationship between economic activity and transport in New Zealand, especially from social and environmental perspectives. The authors assert that much of the international literature on the subject tends to ignore the difficulties of precisely defining decoupling. In this respect, they insist that the impact of policy measures regarding decoupling must be assessed based on key economic, social, and environmental indicators, such as GDP, employment, sectoral performance, mobility, access, pollution, and congestion.

4.2.3 Measures for building up a sustainable intermodal transport system

A great need exists to pursue ways to develop mobility solutions that utilize each mode's commercial and technical advantages so as to create an intermodal system that minimizes negative impacts and enhances the productivity of local, regional, national, and international transportation systems (Szyliowicz, 2003). Considering the overarching role of road freight transport in the current transport system in the EU, shifting freight from road to water and rail has become an important strategic element to create an intermodal transport system with a rational split between various modes in the EU transport policy. The objective was first formulated in the Sustainable Development Strategy (SDS) (EEA, 2004). In the review of the T&E integration strategy in 2001 and 2002, the Council stated that the modal split should remain stable for at least the next ten years, even with further traffic growth. In the White Paper on the Common Transport Policy (CTP) "European Transport Policy for 2010: Time to Decide", the Commission proposed a number of measures aimed at modal shift and stimulating the growth of short sea shipping, rail and inland waterway transport, as well as

increased intermodal transport, including linking up sea, inland waterways, and rail by improving the performance of the alternatives to road transport; using short sea shipping, rail, and inland waterways to develop "motorways of the sea"; encouraging the gradual development of trans-European corridors for priority or even exclusive use by freight trains; developing the new Marco Polo programme for helping start up intermodal services; and encouraging the emergence of freight integrators (EC White paper, 2001). Most of the measures have important meanings for China to use as references.

4.3 Assessment of the relationship between China's freight transport and economic activity

Along with the rapid growth of traffic, many societal problems are arising from transport activities that affect sustainability in China. NBS (2004) shows that the total number of deaths in traffic accidents in 2003 reached 104,000 people; in other words, every day in China approximately 300 people were killed in traffic accidents. The accident death rate per million cars amounted to 108, ranking the country top in the world for both the death toll and the death rate (NBS, 2004). The figure is growing by 10 percent every year. One study (He *et al.*, 2005) presented a comprehensive computation of energy use and CO_2 emissions from China's transport system (including road, water, rail transport, and aviation) in 1995 and concluded that the road transport system accounted for 61 percent of oil consumption and 70 percent of CO_2 emissions of the whole transport sector. From 1997 to 2002, according to He *et al.* (2005), oil consumption by the Chinese road transport system increased from 47 to 73 million tons a year, with an average annual growth rate of 9%. This shows that the road transport sector is one of the most rapidly growing sectors in China in terms of oil consumption. Total CO_2 emissions from Chinese on-road vehicles were estimated to be 148 million tonnes in 1997 and 230 million tonnes in 2002, an increase of 55 percent in five years, despite improvements in fuel efficiency and transport maintenance in recent years. Figure 4-1 presents the CO_2 emission of Chinese on-road vehicles over the past several years, in which freight transport (traffic) carries an important share.

To achieve any degree of sustainability of intermodal transport requires at least some consideration of the link between transport demand and economic growth and whether it is desirable and/or possible to decouple the link (Tight *et al.*, 2004). In this context, the relationship between freight transport and economic activities in China is discussed in this section.

Figure 4-2 presents recent trends in freight transport and economic activity up to 2006. From the figure, it is clear that a strong link exists between freight transport demand and economic activity. Meanwhile, the trends in the figure and Table 4-2 show that the growth of freight transport has always lagged behind the growth of the Chinese economy in past decades; the average annual growth rate of GDP was 8.7 percent while (total) freight transport was 7.9 percent from 1996 to 2006, in which the average annual growth rates of railway and highway were just 4.8 percent and 5.5 percent, far less than the growth of waterway and airway

transport during this period. The reason for this is the infrastructure (high-graded highway and railway in particular) constraints, mainly in the middle and western regions of China. Meanwhile, the rapid growth of Chinese external trade, which is normally generated in the coastal area, is another reason for the significant differences between different modes in the growth rate.

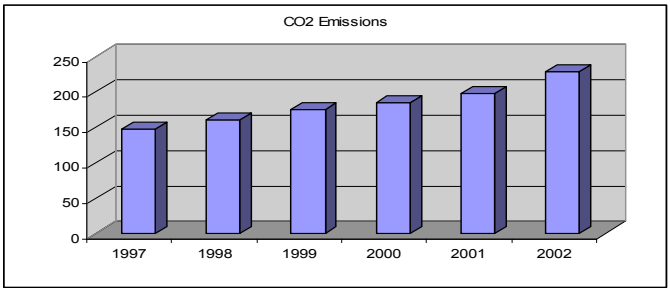

Figure 4-1: CO_2 emission of Chinese on-road vehicles (million tonnes)
Source: Kebin He *et al.*, 2005

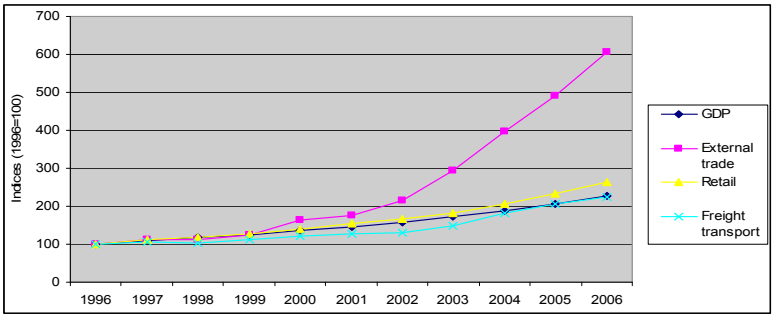

Figure 4-2: Linkage between freight transport and economic activity in China
Source: NBS, 1997-2007

Based on Table 4-2, the short-term elasticity of freight transport demand wrt economic activity measured in terms of GDP, retail, and imports and exports, respectively, as shown in Table 4-3 and Figure 4-3, can be calculated according to formula (2), as proposed by Tapio (2003).

From Table 4-3 and Figure 4-3, we can see that almost all elasticities of transport (particularly road) in China have remained below 1 over the past decades, except for waterway and airway transport, which show much greater growth than that of the Chinese economy (GDP) as shown in Table 4-2 (mainly due to the rapid growth of Chinese external trade, which is normally generated in the coastal area, just as mentioned above). According to the definition of decoupling, this assumes that the decoupling (or weak decoupling) of economic and freight transport growth has existed in China, although no intentional action against breaking the link

between the growth of economic activity and freight transport demand has been taken.

Table 4-2: China economic growth and freight transport growth (tonne-km), 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average Annual Growth Rate
GDP	9.7	8.8	7.8	7.1	8.0	7.3	8.0	9.1	9.5	9.9	10.7	8.7
Retail	19.4	11.1	6.8	6.8	9.7	10.1	8.8	9.1	13.3	12.9	13.7	11.1
Import	5.1	2.5	-1.5	18.2	35.8	8.2	21.2	39.9	36.0	17.6	20.0	18.5
Export	1.5	20.9	0.5	6.1	27.8	6.8	22.3	34.6	35.4	28.4	27.2	19.2
Total freight transport	1.5	4.9	-1.3	8.2	7.1	4.8	3.8	13.1	23.8	12.8	8.4	7.9
Railway	0.5	1.0	-6.2	2.6	6.1	6.7	6.2	10.2	11.8	7.5	5.9	4.8
Highway	6.5	3.1	3.1	5.6	4.4	0.8	5.9	3.4	7.0	9.3	11.0	5.5
Waterway	1.2	8.3	0.7	12.6	8.5	4.7	1.9	17.3	35.7	16.0	8.5	10.5
Airway	13.6	16.8	14.9	26.5	14.6	3.8	17.9	12.3	24.0	9.9	19.5	15.8

Source: NBS, 1997-2007

Table 4-3: Freight transport (tonne-km) elasticity of economic activity in China

	1996-2006				
	Total freight transport	Railway	Highway	Waterway	Airway
GDP	0.91	0.55	0.67	1.21	1.82
Retail	0.71	0.43	0.50	0.95	1.42
Imports	0.43	0.26	0.30	0.57	0.85
Exports	0.41	0.25	0.29	0.55	0.82

Source: Author's calculations based on NBS, 2006

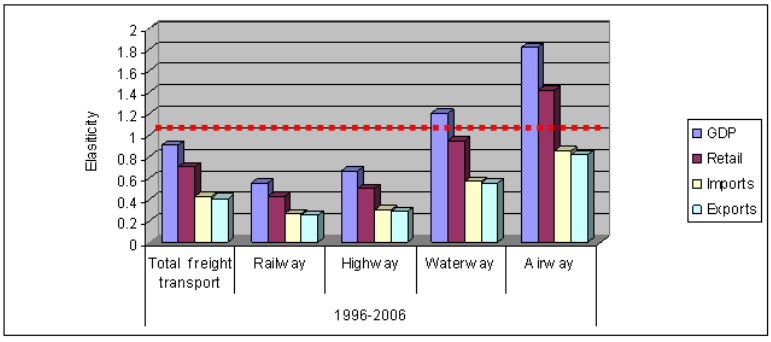

Figure 4-3: Transport elasticity of economic indices in China (tonne-km)

Source: Author's calculations and drawing based on NBS, 2006

Tapio's (2003) formula simply gives a static description (at a point in time) for the elasticity of transport wrt economic activity. Actually, the Chinese economy and transport, especially foreign trade, waterway transport, and airway transport, over the past decade have varied considerably, as shown in Figures 4-4, 4-5, and 4-6. From these figures we can see that Chinese external trade has experienced drastic fluctuations in the past decades; the unstable environment of China's international trading may be one of the major influencing factors for these fluctuations. The volatile external trade has also driven the variability in Chinese waterways (including coastal and inland shipping) and airway freight transport. This may partly explain why the elasticity of waterways and airway transport wrt economic activity is greater than 1 as presented in Table 4-3 and Figure 4-3.

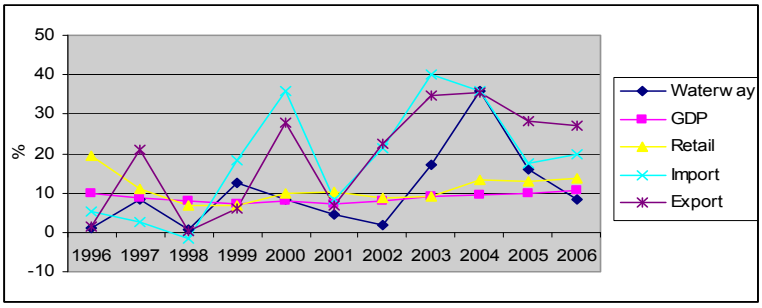

Figure 4-4: Changing relation between freight transport (Waterway, tonne-km) and economic activity in China

Source: Author's drawing based on NBS, 2006

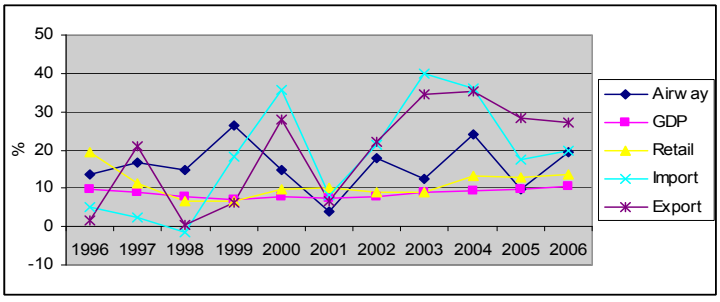

Figure 4-5: Changing relation between freight transport (Airway, tonne-km) and economic activity in China

Source: Author's drawing based on NBS, 2006

For this reason, the multiple regression of eq. (4) is used to calculate the elasticity of transport wrt economic activity. Chinese transport activities in waterways and airways and economic activity in imports and exports fluctuated irregularly and violently in the past decade. According to the statistical calculation performed by author, there is no statistical significance

found in Chinese transport activities in waterways and airways and economic activity in imports and exports. To ensure meaningful statistical analysis of the study results, they will be ignored in the following estimation of the changing relationship between freight transport and economic activity. Table 4-4 describes the elasticity of freight transport (total traffic, railway, and road traffic) wrt economic activities (GDP and retail) in China based on the multiple regression model of eq. (4).

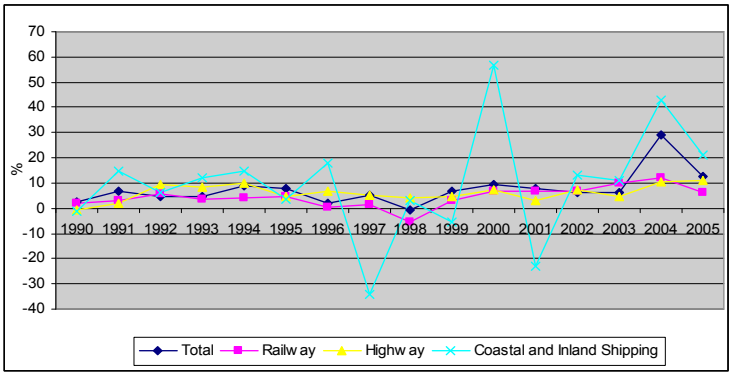

Figure 4-6: Growth of Chinese freight transport, 1990-2005

Source: Author's drawing based on NBS/ MOC1, 2006

Table 4-4: Elasticity of freight transport (%Δt-km Total traffic, Railway, Highway) with regard to economic activities, 1989-2005

Total traffic	**%ΔGDP**	**%Δ Retail**	**Constant**
Elasticity	0.204689	0.413026	1.389103
Standard Error	0.901042	0.535857	7.794162
R2= 0.073183, F=0.513252, *Sey= 6.801657, **df =13			
Railway	**%ΔGDP**	**%Δ Retail**	**Constant**
Elasticity	0.357463	0.26132	-1.57382
Standard Error	0.536783	0.447005	5.116286
R2= 0.099199, F=0.715796, Sey= 4.07312, df =13			
Highway	**%ΔGDP**	**%Δ Retail**	**Constant**
Elasticity	0.939416	0.421869	-6.92342
Standard Error	0.2429154	0.202287	2.315319
R2= 0.720307, F=16.73978, Sey= 1.8432459, df =13			

*The standard error of the *y* estimate; **degrees of freedom.

Source: Author's calculations based on NBS, 2006

As Table 4-4 indicates, road transport has a rather strong link with economic growth (GDP) in China, while the total freight transport and railway transport appear to be weakly linked with economic activity.

Another way of expressing the relationship between transport and economic activity is by looking at the ratio of transport (tonne-km) to overall GDP, which is known as the transport intensity of GDP (Ballingall *et al.*, 2003). Figure 4-7 shows the changes of this ratio in China in the period 1995-2004.

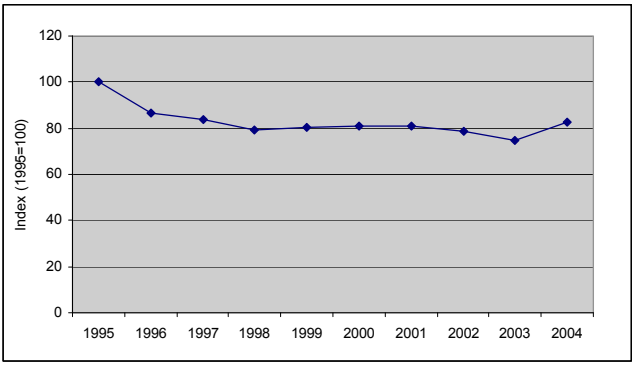

Figure 4-7: Changes in transport intensity in China, 1995-2004
Source: Author's drawing based on NBS, 2006

As these figures and tables illustrate, China appears to have experienced decoupling over the last decade. In other words, the strength of the relationship between transport and economic growth in China is not as strong as that of Europe, although no intentional efforts to break the link between freight transport growth and economic growth have been made by the Chinese government. However, although it has seen a steady decline over the past few years, freight transport intensity in China is still much higher than that in US and EU, as shown in Table 4-5. However, the difference would not be so big in terms of purchasing power parity of Chinese currency (RMB). In this context, the Chinese government has to take purposeful action, which might include dematerialization of the economy, increasing the cost of road freight transport by internalizing externalities, revitalizing railways, better freight organization and integration techniques, cleaner vehicle technologies and the establishment of local production 'clusters' (Ballingall *et al.*, 2003), to decouple transport activity from economic activity considering China's rapid economic growth.

Table 4-5: Transport intensities: US, EU, and China* (t-km per US$ of GDP)

	1985	1998	2005	2006
US	0.75	0.64	--	--
EU	0.43	0.49	--	--
China	6.29	3.90	3.48	3.36

*Exchange rate: US$1 equals 2.94 RMB in 1985, 8.28 in 1998, 8.11 in 2005, and 8.00 in 2006 (Chinese Academy of Social Sciences, CASS)

Source: Gilbert *et al.*, 2002
NBS, 1985, 1998, 2005, 2006

4.4 Possible factors affecting the weak link between transport demand and Chinese economy

Based on the figures provided, it appears that the connection between Chinese (total) freight transport and economic activity is weak, but road traffic has a relatively strong relation with the economy. This pattern is further supported by Huenemann (2001). In his study, he argues that, since 1980, the elasticity of transport volume to GDP in China has often been less than 1.0, with some downward trends. As regards possible reasons behind the weak link, Huenemann identified the following: reduction of the weight of cargo, especially raw materials in heavy industry before shipping, such as washing coal; converting logs to sawn lumber; concentrating and smelting minerals; the coastal concentration of growth; the structural shift of GDP towards sectors that are less transport-intensive; and (statistical) measurement errors in road traffic. Further attention is paid to the explanation of unbalanced regional distribution of China's economy and possible statistical measurement errors in road traffic in the following discussion.

The varying level of economic development and transport infrastructure between eastern, central, and western regions in China has long existed. Coastal regions have often grown rapidly in economic activity and external trade, while those in the interior have fallen behind. For instance, the top nine provinces, ranked in terms of volume of external trade, accounted for more than 90 percent of China's total trade in 2004. These nine provinces, which are also manufacturing centres of China, are all along the coast. The remaining 22 interior provinces, constituting 68.3 percent of the total population, accounted for less than 10 percent of foreign trade (NBS, 2005) Correspondingly, transport logistics demand has remained concentrated in the central and coastal provinces, around the three major areas of Bohai Bay (Beijing/Tianjin), Yangtze River Delta (Shanghai/Ningbo), and Pearl River Delta (Guangzhou/Shenzhen). Cargo movement and industry output are highly concentrated in these areas, the country's top sea ports are located here, and the cities of these three areas are well connected by road networks (McKinsey & Company, 2001). Figure 4-8 presents the differences in road traffic among the three areas in China.

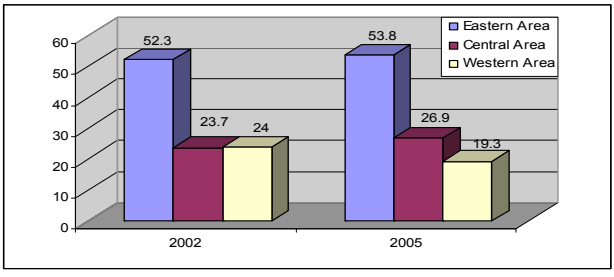

Figure 4-8: Road traffic (vehicle-km) share (%) in areas of China
Source: China Logistics Report, 2005

The coastal concentration should reduce the number of tonne-km associated with a given level of output. Indeed, the rapid growth of China's external trade-oriented economy has driven the fast growth of freight traffic over the past decade, especially in road and port traffic. Figure 4-9 shows the growth rate (%) of container traffic (TEU) in China's road and coastal ports over the past few years. Although container traffic growth rate per year over the past few years has seen a decline mainly due to the total volume of container traffic in every year getting much bigger than before, it still reaches more than 20 percent per year.

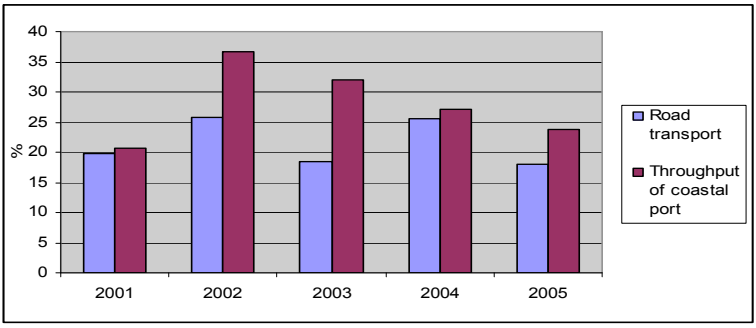

Figure 4-9: Growth rate (%) of container traffic (TEU) in China's road and coastal ports
Source: MOC1, 2005; NBS, 2005

Nevertheless, this does not indicate a corresponding increase in freight volume in terms of tonne-km, as shown in Figure 4-10, mainly due to the short (road) freight haulage distance (see Figure 4-11) as a majority of external trade originates from the coastal area. Considering the more than 70 percent share of road transport in inland transport modes in terms of tonnes, as shown in Figure 4-12, the growth of freight transport falling behind the growth of economic activity can be partially explained.

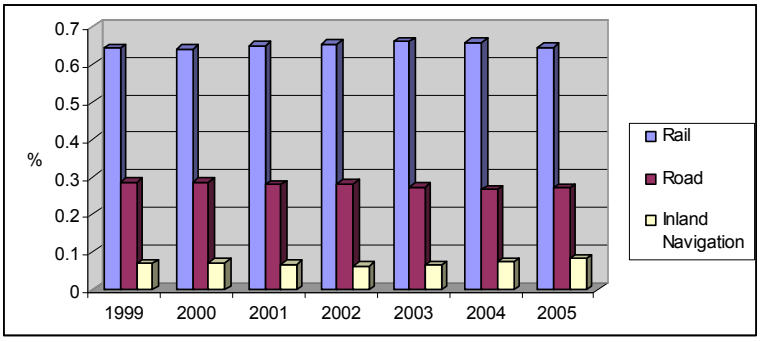

Figure 4-10: Changes of inland mode shares (%, tonne-km) in China, 2000-2005
Source: MOC1, 2005; NBS, 2005

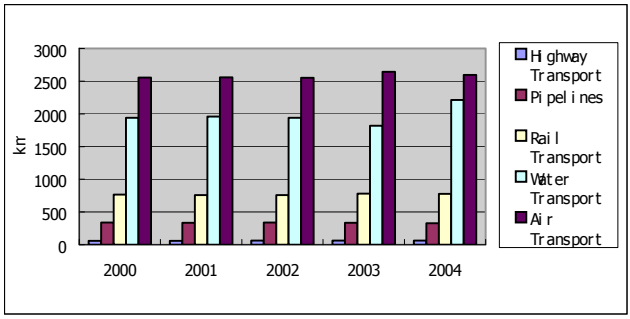

Figure 4-11: Average haulage distances of transport modes in China (km), 2000-2004
Source: MOC1, 2005; NBS, 2005

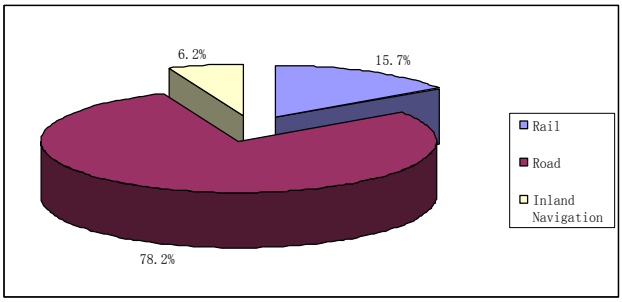

Figure 4-12: Inland mode shares (%, tonne) in China, 2005
Source: MOC1, 2005; NBS, 2005

With respect to possible statistical errors in road freight traffic, Huenemann (2001) argued that the published transport statistics for road traffic in the 1990s failed to capture a significant portion of the actual tonne-kms and passenger-kilometres; moreover, the problem seemed to get worse as the decade progressed. Huenemann reasoned that past decades have seen a low growth of water transport due to the disadvantage of low speed and unpaired origin–destination connections, whereas in rail transport it was because of substantially increased tariffs and fares and a large amount of capacity occupied by passenger transport. However, Huenemann asserted that the situation with road traffic is quite different. The last two decades have witnessed a significant increase in the number of collective and private vehicles, for which the systematic gathering of data is more problematic than for the state-owned fleets. According to the data on fuel use in transportation, Huenemann strongly suggests that the true growth rate of traffic in recent years has been significantly faster than what published data indicate. Table 4-6 displays the growth rates for petroleum consumption in the transport sector. Based on these, the growth rate of petroleum consumption in the past few decades is much faster than the growth rate of total freight and road freight transport. Considering the improvement of fuel efficiency for transport in the recent few years, it can be concluded that the statistics for freight transport (tonne-km) for the past decades have failed to

capture a significant portion of the traffic.

Table 4-6: Petroleum consumption in China's transport sector from 1980

Year	Petroleum consumption in transport logistics sector*	Compound annual growth rate of Petroleum consumption (%)	Growth rate of total tonne-km (%)	Growth rate of road tonne-km (%)
1980	911.5			
1985	1176.4	5.2	8.8	20.0
1990	1683.2	7.4	7.4	12.0
1995	2863.6	11.2	6.5	6.9
2000	5509.4	14.0	4.3	5.5
2003	7093.2	8.8	6.7	5.0

*Including Transport, Storage, Post and Telecommunication Services

Source: Huenemann, 2001; NBS, 2005

China's widespread overloading of trucks, among other vehicles, may be one of the factors contributing to potential measurement errors in the statistics of road traffic. Currently, Chinese trucking companies face fierce competition, low freight rates, and heavy toll fees that normally constitute 20 to 40 percent of the total transport cost (Dai, 2005). With such low profit margins, many trucks in China are carrying loads heavier than they are authorized to carry. This is especially the case for freight transport of low-value cargo such as coal and agricultural products. Although the Chinese government has escalated efforts to curb such overloading, it is still a big problem in China's road freight sector. While overloading weakens roads and bridges—and, more importantly, poses the risk of harm to freight and passenger safety—the volume of overloaded cargo is normally not recorded in the statistics of road traffic.

4.5 Building up a sustainable intermodal shift in China

The figures provided above show that although there is no deliberate initiative of decoupling, the connection between Chinese (total) freight transport and economic activities is weak, but road traffic has a relatively strong relation with the economy, especially in terms of freight transport intensity. In this regard, the Chinese government has to take purposeful action to ease the link between economic growth and transport growth in order to build up a sustainable intermodal shift. Regarding the gradual break in the automatic link between economic growth and transport growth, measures designed by the EU (White Paper, 2001) can be summarized under three main headings (Tight *et al*., 2004), which include a package of measures, such as reducing road transport, shifting towards more environmentally friendly modes and revitalizing alternative modes; and targeted investments in the Trans-European Networks (TEN) that will have an immediate impact on modal choice—more specifically measures that will make road haulage less attractive (Meersman *et al.*, 2003).

In the case of China, its anticipated rapid economic development will undoubtedly result in greater demand for personal mobility and freight transport services. Therefore, a great need

still exists for modernizing China's transport infrastructure to meet the growing demand for freight transport, including road freight transport. In this respect, an integrated approach will be a good choice for building up sustainable transport chains, which involves making road transport more expensive through a full internalization of external costs through fiscal policy and increasing the efficiency of other modes together with revitalizing these alternative modes through investment aimed at intermodality, technology, quality, safety, and efficiency (Meersman *et al.*, 2003).

Over the past decade, provision of infrastructure for hinterland transportation (road transport, rail transport, and inland navigation) has received sufficiently high attention. The question is which combination of modal investments will be favourable? The identification of the optimal split of freight movement between road and other alternative modes, such as rail and inland navigation, could lead in benefits in many areas, such as reduced highway congestion, improved air quality, reduced pavement preservation costs, improved safety, offsets to trucking labour shortfalls, and improved service of alternative modes yielding the highest returns to investors (CUTR, 2007). However, unlike its developed counterparts, China has not yet given the same attention to determining the factors influencing modal choice and intermodal shift. In order to understand modal choice, it is necessary to understand the key factors affecting it and evaluate where each factor comes into play during the decision-making process. The same is true in terms of identifying factors holding the potential to influence transport logistics chains through policy intervention (Norojono *et al.*, 2001).

4.5.1 Identifying the primary factors influencing intermodal shift

In a globalized and competitive environment characterized by complex logistics and supply chain structures, public agencies, sectoral authorities, or local governments can acquire valuable information and make better decisions or implement regulations to increase the efficiency of the transport system and improve the competitiveness of a region (Danielis, 2005). In this context, determining the primary factors influencing freight modal shift from a macro level is essential in formulating the appropriate policy for a sustainable transport chain.

From a business point of view, modal shift is generally driven by a company's desire to remain competitive by serving its customers both effectively and efficiently. The attractiveness of a transport network is always determined by its characteristics and quality: cost, time, reliability, etc. Most studies have addressed the economic factors that influence modal shift. In containerized transport, three factors—costs, time in transit, and reliability of transit time—play vital roles in determining intermodal choice to a large extent (Cullinane *et al.*, 2000; McGinnis *et al.*, 1981). In regard to intermodal freight transport, the decisions of shippers depend upon their quality requirements for specific logistics chains and the quality and price of intermodal transport offerings in relation to the quality and price of alternatives, as shown in Table 4-7 (Cardebring *et al.*, 2000). The improvement of these quality dimensions is key in increasing the share of intermodal freight transport and in enabling intermodal transport to play a fuller role in regional cohesion, integration, and harmonization as well as in national/regional economic efficiency, competitiveness, and sustainability. In addition, a policy dimension in the quality requirement regarding intermodal choice has to be considered.

According to Cardebring *et al.* (2000), isolated corridor services may be profitable for those who operate them, but they can undermine the economic viability of network operators and contribute little to socio-political objectives, such as enhancing cohesion or reducing freight transport externalities.

Table 4-7: Seven quality dimensions of intermodal transport

Quality dimensions	Definitions
Time	Total time between the moment that the Intermodal Transport Unit (ITU) is ready for transport and the delivery
Reliability	Absence of unforeseen deviation in performance
Flexibility	Ease of adjusting to an unexpected change in logistic requirements
Qualification	Capacity to cope with complex logistic requirements
Accessibility	Ease of using the intermodal transport system
Control	Ability to obtain information on the status of the cargo
Security	Risk of loss or damage

Source: Cardebring *et al.*, 2000

A sustainable transport chain must be more than economically efficient and financially sound; it must also be environmentally friendly, safe, and secure and contribute to social development. The elaboration and implementation of such a framework permits the analysis of the strengths and weaknesses of each mode and of the ways in which the latter can be remedied so as to permit the emergence of a sustainable intermodal system. In this respect, three dimensions (factors) must be considered when seeking to harmonize an intermodal system with the objective of sustainability: technologies involved, planning and policy processes, and numerous ethical issues (EEA, 2005). For this, the factors that affect modal choice (intermodal shift) at the macro level must be examined, considering mobility and accessibility, reliability, safety and security, environmental performance, cost, infrastructure condition, and economic growth and employment improvement (Jin *et al.*, 2004).

4.5.2 A sustainable transport chain: Government intervention and policy instruments

Efforts to build a sustainable transport chain can be translated into a number of measures (Tapio, 2003; Meersman *et al.*, 2003), which include reducing demand for transport—especially road transport—shift towards more environmentally friendly modes by supporting other transport systems—especially rail and inland waterway systems and their efficient, full internalization of external costs—and improving vehicles/fuels. These measures, proposed by the EU, can be helpful for China in establishing a sustainable (intermodal) transport system, although among them, reducing demand for transport, especially for road transport may not be a practical solution considering China's fast economic growth and external trade—particularly the potential development of remote areas in which transport infrastructure is lacking sufficient capacity to deal with demand and is still in need of modernization. Instead, redistribution between modes should have an immediate impact on modal choice (Meersman *et al.*, 2003). For a more favourable intermodal shift, it appears that important investments will need to be made in dedicated freight railways (a high-speed

dedicated passenger line from Beijing to Wuhan and Guangzhou is currently under construction. This will make the current railway from Beijing to Wuhan and Guangzhou dedicated to cargo transport) and inland waterways in China at this stage.

Regarding the revitalization of alternative modes to road freight transport, in addition to inland waterways and coastal shipping, improving the efficiency of rail transport by reforming its administrative regime and liberalization must receive more attention of the Chinese government as the railway holds a historically dominant position in China's freight transport. Undoubtedly, it is unlikely that the rail sector will be able to respond to growing market demands in an efficient, innovative, and responsive manner as long as it is managed by the government. Without reform, a real risk exists that transport bottlenecks in railways will develop, constraining the growth of the Chinese economy and limiting the extent to which the rapid growth in China's coastal regions will spread to the interior. Any thorough reform of the Chinese rail sector will involve the restructuring of the current rail enterprises (OECD, 2002). Actually, with policy initiatives that encourage external investment in railways, various types of joint-venture railways have emerged in China. By 2004 the joint-venture model had been used for some 27 (mainly branch-line) projects. During 2005, 19 new joint-venture railways were created, and plans are in place for another 30 (World Bank, 2006). Therefore, over the next few years, a more extensive multi-operator railway environment will emerge in China. Meanwhile, a process of restructuring and consolidation is also under way to strengthen the operational and financial capacity of the existing joint-ventures. In this context, there may be various new organizational forms (SOE, private, and joint-venture) in China's railway sector in the future. These forms are likely to be established under a range of ownership structures. Such diversity will inevitably require policies, procedures, charging mechanisms and regulations, in such areas as track access, vehicle interchange, and revenue division (World Bank, 2006). Fair and transparent rules for managing the economic relationships (or interfaces) among operators are critical in giving investors confidence to participate in China's rail industry. As a result, increasing attention must be given now on how China's joint-venture railway model might contribute to the improvement of railway competition.

Fair and efficient pricing based on a full internalization of external costs of all modes, not only road transport, and the application of the marginal cost pricing principle, has been proposed by the EU to promote sustainable transport chains. In practice, heavy goods vehicles (HGV) weighing 12 tonnes or more are obliged to pay a special fee to be allowed to use certain motorways in the northern part of the EU according to EU's Eurovignette Directive (1999/62/EC). The Eurovignette system, which aims to succeed the previously diversified European pricing systems, is currently used by Sweden, Germany, Denmark, Holland, Belgium and Luxemburg (Dickinsson, 2006). In the previous pricing system, charges were generally not related to environmental or other "external" costs. As a result, users were given only limited incentives to adjust transport patterns and technologies to reduce costs while infrastructure managers seldom received sufficient revenues from direct user charges to fund investments (EU, White Paper, 1998). The Commission, therefore, adopted a stepwise approach in applying "marginal social cost pricing", charging principals within a community framework for infrastructure charges to correct market failure in the European community's

transport sector.

A main principle of the EU's infrastructure charging policy is that transport taxes and charges, in every mode of transport, should be varied to reflect the cost of different pollution levels, travelling times, and damage costs as well as infrastructure costs. The application of the "polluter pays" principle and clear fiscal incentives help achieve the goals with regard to reducing transport congestion and pollution, rebalancing the modal split, and decoupling transport growth from economic growth. The appropriate charging and pricing helps make better use of the existing infrastructure capacity. As a start, in 2003, national systems of toll and road use charges for heavy goods vehicles were aligned and based on the common principles (Hensher *et al.*, 2005). As one of the first steps taken by the Commission, a more cost-related electronic kilometre charge scheme has been introduced to replace the current Eurovignette system.

In the case of China, the principle of full internalization of external costs should be applied too, in order to rebalance China's modal split. At this stage, the introduction of a fuel tax regime should be considered, as the proper fuel tax in China—as in other countries—will be the instrument of choice for limiting car use, vehicle pollution, and energy intensity in the economy. Proceeds from the tax could be used to promote the government's goals or reduce other taxes (e.g., on labour) to promote growth and employment. Apart from these principal considerations, practical issues are also at stake. A fuel tax is easily administered because only a few fuel producers exist and taxation "at the source" is easy (World Bank, 2007).

4.6 Conclusions

In line with its goal of social harmonization in which harmonization between economic development and the human and natural environment is an important initiative, China has to make efforts to build up a sustainable transport chain, as transport—particularly road transport—is one of the major contributors to social and environmental problems (e.g., air pollution, congestion, air pollution, noise, land use, and safety issues/accidents). As such, there is a need for China to pursue ways to develop mobility solutions that utilize each mode's commercial and technical advantages so as to create an intermodal system that minimizes negative impacts on the environment. However, intermodality is not always synonymous with sustainability. Thus, it is necessary to envisage an intermodal system that is truly efficient and maintains existing service levels in distribution using slower, environmentally friendly modes of transport (Tavasszy, 2003). As a result, a range of policy instruments, such as the introduction of a fuel tax regime and the revitalization of alternative modes to (long haulage) road freight transport, with a particular focus on macro-economic policy, land-use policy, and new technological developments, should be adopted in order to provide incentives for modal shift towards environmentally friendlier modes (intermodal, rail, inland waterways, and pipelines).

Chapter 5 Policy Optimization for Sustainable Transport Logistics: A Case Study of Reversing Flagging out in Chinese Shipping

Making appropriate policy decisions to improve the quality of more environmentally friendly modes such as rail and water transport that compete with road haulage is an urgent need for true intermodality (Meersman *et al.*, 2003). For the Chinese shipping sector, which is not yet perfectly integrated into the nationwide transport logistics network, a policy on maritime safety and a policy aimed at the reflagging of ships to China's registers will promote the integration of the shipping sector into a "one-stop shop" logistics chain, as shipping is the predominant mode of transport for international trade; indeed, over 90 percent of China's foreign trade is carried by sea. In this respect, finding an optimal policy alternative is extremely important for maximizing the average performance of a transport logistics system. To this end, this chapter seeks to model policy optimization based on a case study of reversing flagging out in the Chinese shipping sector.

5.1 Introduction

Changing a vessel's registry from an "expensive" to a "cheap flag" has long been a worldwide phenomenon. This "internationalization" strategy has mainly been adopted by traditional (developed) maritime countries (TMC) in order to reduce operating costs and fiscal pressures as well as enhance overall operational flexibility. Over the years, since the inception of the institution of open registries in the 1950s, a substantial number of studies have been conducted on this phenomenon, but their overriding focus on TMC policies has not always provided an adequate example of the different "realities" of the new developing countries (NDC), such as China, that are also following suit at an increasing rate (Haralambides & Yang, 2003).

The flagging out of Chinese-controlled vessels started to appear, due to a number of mainly political reasons, at the same time as in other nations (1950s), but it took on massive dimensions and momentum with China's opening to the outside world in the 1980s, particularly since the reform of the country's tax regime in the 1990s. As in many other countries, this evolution is becoming increasingly serious in terms of its negative impacts on the country's economic development, particularly for as long as flagging out continues unabated. Given the variety and eligibility of positive measures, taken predominantly in the European Union in order to reverse similar trends, China could by no means be accused of "protectionism" were it to adopt more preferential shipping policies in order to reflag vessels to its national registry.

In the following sections of this chapter, international and Chinese experiences and developments in flagging out are reviewed (section 5.2). At the same time, the impacts of

flagging out on international shipping, national economies, and society are discussed. China's motivations for flagging out are also addressed. The determinants of "adjustment" in shipping policy are identified in section 5.3. Here, fuzzy set theory and related models—as well as an international questionnaire survey—are introduced to assess the economic effects of flagging out through context-dependent economic and societal indicators (factors). Section 5.4 is based on the determinant analysis of fuzzy models and primarily probes the "policy competition" and "government intervention" policies to counteract flagging out. In this context, a comparative shipping policy analysis is undertaken between China and TMCs in order to evaluate the degree of openness evident in China's shipping policy and explore possible policy alternatives.

5.2 The evolution and impact of flagging out

5.2.1 Worldwide situation of flagging out

The use of the flag of convenience (FOC) institution dates back to 1922, when the US took the initiative to permit the registration of American ships in Panama. Presently, as a result of lower crewing costs, tax exemptions, and minimal bureaucracy, the greatest proportion of the world merchant fleet is registered under FOCs (Fig. 5-1).

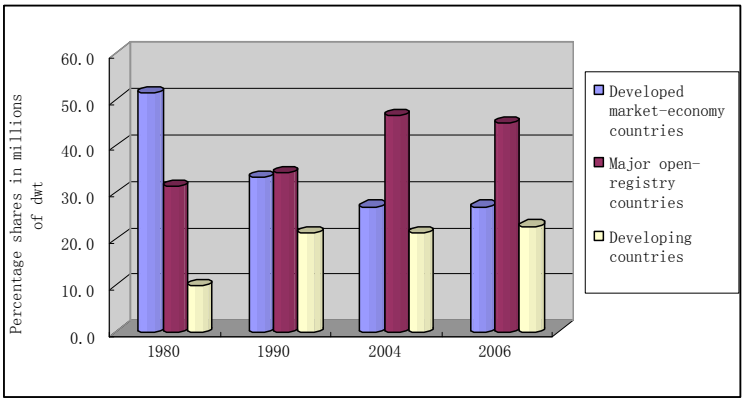

Figure 5-1: Composition of the world fleet by groups of countries of registration
Source: Review of Maritime Transport, UNCATD, 2006

According to UNCTAD, the 35 most important maritime countries and territories, controlling 95.17 percent of the world merchant fleet, continued to register tonnage under foreign flags in 2005, with the total tonnage registered under foreign flags increasing to 577.1 million dwt (66.9 percent of the 35 countries' total fleet) as compared to 523.3 million dwt (65.6 percent) in 2004. The tonnage of open-register countries increased marginally in 2005, by 27.9 million dwt to 431.9 million dwt. Over two thirds of these beneficially owned fleets are owned by developed market-economy countries.

Among these 35 most important maritime countries and territories, developing countries and

territories continued their recent trend towards registering tonnage under foreign flags. In 2005, the 14 developing countries and territories—including China, Hong Kong (China), Republic of Korea, Saudi Arabia, and the UAE—registered 46 percent of their total tonnage under foreign flags. For developed market-economy countries, the share of foreign-registered tonnage increased to 73.8 percent in 2005. In some countries, the opposite trend was at work. For instance, in 2005, Germany raised its total tonnage to 71.5 million dwt (57.9 million dwt the previous year), while its foreign flag fleet decreased from 84.4 to 81.7 percent; this might reflect some incentives applied in the EU countries to attract tonnage, such as the introduction of tonnage taxes and the relaxation of manning requirements for ships registered in national second registers.

5.2.2 Evolution and extent of flagging out in China

Chinese shipping has witnessed strong growth over the past decades as a result of rapid industrialization, economic growth, and trade. At the beginning of 2006, the number of vessels registered in China was 1,763 (UNCTAD, 2006), corresponding to 29.8 million dwt. This capacity ranked China second in the world and fourth if FOC registered tonnage is included. In the same year, the latter tonnage comprised 1,130 ships of 35.7 million dwt. Clearly, in terms of dwt, more than half (54.45 percent) of all Chinese owned or controlled tonnage was registered under FOCs; this trend is continuing. In 1991, the share of FOC tonnage was only 23 percent.

Chinese flagging out started in the 1950s. As a result of western embargo policies, Chinese trade was carried by joint venture companies set up with socialist partners such as Poland, Czechoslovakia, and Albania. By the 1960s, China had built up its own fleet under its national flag, although a small number of vessels were still flagged out in order to seize trading opportunities with countries with which China had not yet established diplomatic relations.

Flagging out took on massive dimensions and momentum with the opening up of the country in the 1980s, especially after China's tax reforms in 1994. As in all other cases, profitability and operational considerations were the prime movers in the flagging out process. A number of such considerations can be mentioned, including (i) high tariffs and value-added taxes (27 percent) on imported ships and (ii) industrial carriage—shippers registering their own tonnage abroad to avoid stringent company laws, shipbuilding, and trading regulations as well as other limitations imposed on national flag ships. For instance, in 1998, the Beijing-based Capital Iron and Steel group owned 1.1million FOC tonnage with future plans to develop an additional modern bulk cargo fleet exceeding 4 million dwt in cooperation with a British shipping enterprise. This fleet was also intended to be registered abroad. In recent years, newly emerging ocean-going fleets owned by Chinese manufacturing enterprises have almost all been registered under FOCs. Importantly, most of China's flagging-out ships are large and new. According to MOC1 (2005), the average tonnage of these flagging out fleets is 36,600 dwt, much bigger than that of the fleet flying the Chinese national flag (8,500 dwt). The average age of the Chinese ocean-going fleet under national register was 18.5 years in 1998, while the average age of FOC vessels under Chinese control was 12 years. Sadly, a significant change of this situation has not emerged in the past few years. In 2005, the average age of the

ocean-going fleet under the Chinese flag was around 15 years, but the average age of FOC vessels under Chinese control was less than 12 years (Hai, 2006).

In terms of composition, the largest part of the Chinese flag fleet consists of bulk carriers (43.8 percent), with tankers in second place (22.1 percent). Cellular containerships represent 11.3 percent, general cargo ships 19.9 percent, and other types of vessels 2.9 percent of the total (UNCATD, 2006). Bulk carriers, tankers, and containerships are also the sectors in which flagging out is most pronounced (63.8, 46.3, and 44.7 percent, respectively—all higher than world averages, which are 52.6, 43.4, and 43.0 percent respectively) (UNCATD, 2006). The same world pattern is observed with regard to flag preference, with Panama, Liberia, Malta, and Cyprus leading the list (Table 5-1).

Table 5-1: Flag composition of Chinese FOC fleet (as of 1 January 1996, 2000, and 2006)

Major Open Registry Flags	1996	2000	2006
Panama	37.4	50.0	38.7
Liberia	37.2	20.6	9.0
Malta	3.5	1.9	0.7
Cyprus	1.7	1.2	0.8
Marshall Islands	0.9	-	-
Saint Vincent	7.2	7.5	-
Cayman Islands	1.3	-	-
Bahamas	-	-	0.6

Source: ISL Market Analysis, 2000; Review of Maritime Transport, UNCATD, 2006

5.2.3 The impact of Chinese flagging out

The widespread flagging out phenomenon, affecting not only the merchant fleet of the vast majority of the traditional maritime countries but also the new developing maritime nations, has attracted a great deal of attention for a variety of reasons (Bergantino *et al.*, 1999). One of the main concerns has been the fact that open registry fleets have expanded at a rate faster than any other fleet in the world; as a result, this expansion has limited the growth of national fleets, with all the related consequences for national defence, fiscal revenue, and the disappearance of national seafarers. In addition, the occurrence in recent years of several alarming incidents involving environmental disasters has increased public awareness of this problem.

In China, flagging out has not only exerted great influence on the "cohesiveness" of the national ocean-going fleet, but it has also caused a series of problems to national macroeconomic control, tax revenues, and employment of seafarers.

As mentioned earlier, imported vessels are liable for import tariffs and value-added tax, totalling 27.53 percent of the price of the vessel. Such taxes have forced a number of ship owners to build or purchase vessels abroad and register them under foreign flags, thereby depriving the country not only of tariff and tax revenues, but also of registration and

inspection fees. As a result of ineffective control over the flagged out ships, corporate taxes may also be lost to China. It is worth noting here that approximately US$5 billion of shipping revenues per year are deposited and spent abroad, with all evident consequences on national foreign exchange reserves and the ability of the country to repay in foreign debt.

5.3 Comprehensive assessment for flag choice decision: A fuzzy evaluation model

5.3.1 General analysis

The decline in nationally owned and registered fleets of recent years has led many European countries to establish "captive" international or second registers. Examples include the UK's Isle of Man, France's Kerguelen Islands, Norway's NIS (Norwegian International Register), Germany's GIS, and Denmark's DIS. International registers such as these are often seen as falling in the "grey area" between traditional registers—where legal, economic, and administrative links are direct and tight—and open registers, where they are very weak (Veenstra, 2000). Seen in this way, they can serve the dual purpose of retaining some control over the national shipping industry and simultaneously satisfying the need for a more competitive environment on the part of ship owners.

For both ship owners and managers, flag choice is a high-level decision involving a number of external experts, such as lawyers, bankers, charterers, manning agencies, and classification societies. Normally, ship owners and managers use a mixture of flags for their fleet, although they generally have a "preferred flag". To a certain extent, ship owners and managers rely on experience and subjective views when making flagging decisions; quite often, such decisions are frequently readjusted on the basis of such fuzzy perceptions as "availability of skilled labour", "maintenance and safety requirements", "public relation considerations", "likes and dislikes" and so on. Clearly, considerations such as these substantially augment the complexity of the choice of flag decision.

To a certain extent, the shipping industry, seen in its entirety, constitutes a highly complex system characterized by uncertainty, both in structure and in measurement accuracy. In such systems, piece-meal deterministic approaches to explaining individual behaviours (such as the flagging decision) are often inadequate. Stochastic (probabilistic) modelling of the overall system, despite its complexity, can achieve much more but, even here, there is a limit to the extent fuzzy perceptions like those suggested above could be taken into account.

The methodology suggested below addresses such concerns through the use of fuzzy set theory. This approach is able to link human perceptions (say, on the issue of flag selection), expressed in verbal propositions, with numerical measurement (indicators). The merit of the method is that it is completely independent of model structure which, in most cases, is only known with little degree of certainty.

Fuzzy set theory was developed by Zadeh in 1965 to deal with imprecise and uncertain problems that have no well-defined, unambiguous meaning (Cornelissen *et al.*, 2000). The theory has been applied to complex (economic, societal, etc.) decision problems that can be

controlled by humans but are hard to define exactly (Mansur, 1995).

Ordinary (classical) sets are based on binary logic. For instance membership to the group of "tall" people (the universal set) can only take two values: 1 for tall and 0 for "not tall". Accordingly, a membership function simply assigns values of 0 or 1 to each individual element in the universal set. Simply, the membership function distinguishes only between non-members and members of the crisp set using a hard threshold. Middle values or partial memberships are not included in the crisp set (Mansur, 1995). However, a hard (crisp) threshold is often unrealistic in practice, because two nearly indistinguishable measurements on either side of the hard threshold will be placed in complimentary subsets (Cornelissen *et al.*, 2000).

Contrary to classical set theory, fuzzy set theory is based on multi-valued logic. Let the universe of discourse U have a fuzzy set A described by a membership function μ_A that takes values in the interval (0, 1), μ_A: U (0, 1). Thus, A can be represented by: $A=\mu_A(x)/x$, where $x \in U$. The membership function μ_A defines partial membership in a set. This means that μ_A assigns to each x a value from 0 through 1, indicating the degree to which x belongs to A. Transition between membership and non-membership, therefore, is gradual rather than abrupt.

The following section shows how to develop comprehensive fuzzy evaluation models to assess the effects of flag choice, based on context-dependent economic, political, and societal indicators or factors. It becomes evident that the methodology is able to define the degree to which such indicators contribute to the choice of flag decision.

5.3.2 Flag choice: Qualitative analysis and fuzzy assessment

The comprehensive fuzzy evaluation (CFE) model proposed here is based on fuzzy set theory as developed by Zadeh and on the analytic hierarchical process developed by Saaty (1980). Zadeh defined fuzzy logic as "the logic underlying models of reasoning which are approximate rather than exact" (Mansur, 1995). Saaty advocated the use of deductive and systems approach in the analysis of complex decision problems. Along these lines, the scheme of a CFE model, to assess the effects of flag choice, is depicted in Fig. 5-2.

Six steps are involved. Step 1 defines model input; the set of judgement factors U_i. These fall into three categories: economic, societal and political. Economic factors consist of operating/manning costs, capital costs, maintenance and safety compliance costs, tax-related expenses, the age and size of vessels, fiscal reasons, etc. It has been shown that, in the EU, manning or crew costs and corporate taxes are the most flag-sensitive cost categories, while capital costs seem to influence the decision to change flag only marginally. For a Chinese ship owner, however, capital costs are perhaps the single most crucial factor in the flagging decision; high import tariffs and value-added taxes, coupled with limited credit lines and unfavourable loan conditions for domestically built vessels easily explain this.

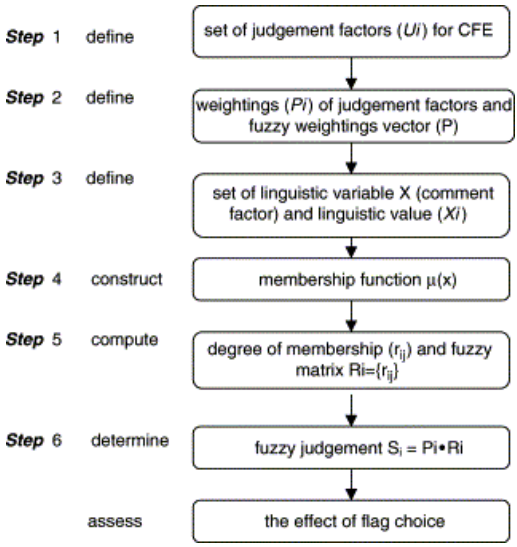

Figure 5-2: The scheme of comprehensive fuzzy evaluation model to assess the effects of flag choice

Source: Author

Societal and political factors in the flagging decision are, however, much more intricate and difficult to assess than the relatively simple capital cost calculations above. These include such attributes as safety standards and requirements, protection of the environment, national defence, labour quality and availability, degree of control, level of bureaucracy, trade union considerations, the general economic and social situation of the home country, the country's industrial structure, public relations, trade restrictions (e.g., embargoes), shippers' preferences, and so on.

As already mentioned, political considerations are also present, albeit to a lesser extent nowadays. These can be seen for instance in the direct seaborne trade between mainland Chinese and Taiwan; according to existing regulations drawn by both sides of the Taiwan Straits, only Chinese (mainland or Taiwan) vessels flying FOC flags are allowed to trade in the direct route across the Taiwan Straits.

To assess how the above factors can influence flag choice—i.e., the choice between "national registry", "second registry", and "open registry"—through the CFE model developed here, a survey was conducted among more than 100 ship owners in major maritime countries. The survey, and related questionnaire, included "relative importance factors" affecting the choice of flag, rated on a scale of 1 (important) to 5 (very important). "Flag preference factors"—national, second, or open registry—were rated 20–29 for preference degree "very low" and 90–100 for preference degree "very high". The 12 judgement factors on which the three alternatives were assessed were: U_1 = crew costs saving advantages; U_2 = costs of

meeting maintenance and safety requirements/bureaucratic control; U_3 = capital, insurance and other costs; U_4 = easiness of bank finance; U_5 = fiscal advantages; U_6 = labour quality and availability; U_7 = vessel characteristics (age, size, type, etc.); U_8 = trading region of the world; U_9 = public relations; U_{10} = country-specific comparative advantages (subsidies, economic power, structure, etc.), U_{11} = political considerations; and U_{12} = union considerations/recognition.

Step 2 defines the weightings of the judgment factors and a corresponding fuzzy weightings vector *P*. Based on questionnaire results (see Annex 2 for details of the questionnaire form), the weightings of the 12 factors are:

3.917, 3.750, 1.600, 2.250, 3.000, 3.500, 2.800, 2.900, 2.350, 3.000, 3.300, and 3.300

Weightings must satisfy the normalization requirement:

$$0.1098+0.1052+0.00449+0.0631+0.0841+0.0981 +0.0785+0.0813+0.0659+0.0841+0.0925+0.0925=1 \quad (1)$$

The fuzzy weightings vector *P* is simply

$$P = [P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}] = [0.1098, 0.1052, 0.0449, 0.0631, 0.0841, 0.0981, 0.0785, 0.0813, 0.0659, 0.0841, 0.0925, 0.0925] \quad (2)$$

Step 3 defines the set of comment factors (linguistic variable X and linguistic value X_i). The linguistic variable refers to the preference degree of flag alternatives, consisting of "very high", "quite high", "rather high", "high", "low", "rather low", "quite low", "very low". According to the importance of the judgment factors, as perceived by the respondents, each factor was given a linguistic value ranging from 20 to 100. These appear in Table 5-2.

Step 4 constructs the membership function $\mu(x)$. Membership functions are at the core of fuzzy models. The membership function is considered to be the strongest and the weakest point of fuzzy set theory (Mansur, 1995). It is strongest because a membership function defines a soft threshold, which allows a smooth and practical assessment of the contribution of the judgement factors to the decision of flag selection, in contrast to a characteristic function, which defines a hard threshold in classical set theory. It is the weakest, because the membership function is regarded as too subjective in relation to its construction. A membership function can be either discrete or continuous. In most cases, membership functions assume continuous forms. There are several alternatives of the functional form; triangular, trapezoidal, Gaussian, bell, and sigmoidal membership functions are the most commonly used (Dubois, 2000).

Table 5-2: Linguistic values of judgment factors

Judgement factors	National registry (X_1)	Second registry (X_2)	Open registry (X_3)
U_1	45.75	53.00	72.50
U_2	56.25	52.50	53.75
U_3	60.50	65.00	81.75
U_4	53.75	51.25	56.25
U_5	54.50	58.00	70.00
U_6	72.00	57.50	57.50
U_7	52.50	54.25	53.00
U_8	56.25	55.00	61.25
U_9	71.25	61.25	55.00
U_{10}	71.25	60.75	49.00
U_{11}	72.00	58.25	56.50
U_{12}	55.25	50.75	61.25

Several studies discuss empirical methods to construct a membership function based on expert knowledge. With regard to the latter, a number of aspects must be considered for the practical application of fuzzy models to the flag decision (Cornelissen *et al.*, 2000). These include the necessary qualifications of experts, the proper elicitation of expert knowledge for the construction of the membership function, and the methods to test the reliability of membership functions. Reliability is also important with regard to verification and validation of the fuzzy model.

In the case of CFE, membership is given in Gaussian form (Liu, 1998) by

$$\mu(x) = e\text{-}0.000278(x\text{-}100)2 \ (0 \leqslant x \leqslant 100). \qquad (3)$$

Step 5 computes the degree of membership (r_{ij}) and the fuzzy matrix $Ri=\{r_{ij}\}$. Based on the membership function (3), the degree of membership for the three registry alternatives can be calculated as follows:

$\{r_{1j}\} = (r_{11}, r_{12}, r_{13})$=(0.4412 0.5411 0.8104)
$\{r_{2j}\} = (r_{21}, r_{22}, r_{23})$=(0.5874 0.5341 0.5518)
$\{r_{3j}\} = (r_{31}, r_{32}, r_{33})$=(0.6481 0.7114 0.9116)
$\{r_{4j}\} = (r_{41}, r_{42}, r_{43})$=(0.5518 0.5165 0.5874)
$\{r_{5j}\} = (r_{51}, r_{52}, r_{53})$=(0.5624 0.6124 0.7786)
$\{r_{6j}\} = (r_{61}, r_{62}, r_{63})$=(0.8042 0.6052 0.6052)
$\{r_{7j}\} = (r_{71}, r_{72}, r_{73})$=(0.5341 0.5589 0.5411)
$\{r_{8j}\} = (r_{81}, r_{82}, r_{83})$=(0.5874 0.5695 0.6587)
$\{r_{9j}\} = (r_{91}, r_{92}, r_{93})$=(0.7947 0.6587 0.5695)
$\{r_{10j}\} = (r_{101}, r_{102}, r_{103})$=(0.7947 0.6516 0.4853)
$\{r_{11j}\} = (r_{111}, r_{112}, r_{113})$=(0.8042 0.6160 0.5909)
$\{r_{12j}\} = (r_{121}, r_{122}, r_{123})$=(0.5731 0.5095 0.6587)

Then, the fuzzy matrix is:

$$R_i = \begin{pmatrix} 0.4412 & 0.5411 & 0.8104 \\ 0.5874 & 0.5341 & 0.5518 \\ 0.6481 & 0.7114 & 0.9116 \\ 0.5518 & 0.5165 & 0.5874 \\ 0.5624 & 0.6124 & 0.7786 \\ 0.8042 & 0.6052 & 0.6052 \\ 0.5341 & 0.5589 & 0.5411 \\ 0.5874 & 0.5695 & 0.6587 \\ 0.7947 & 0.6587 & 0.5695 \\ 0.7947 & 0.6516 & 0.4853 \\ 0.8042 & 0.6160 & 0.5909 \\ 0.5731 & 0.5095 & 0.6587 \end{pmatrix}.$$

Step 6 determines the fuzzy judgment $S_i=P_i \cdot R_i$ so as to assess the effects of the selected flag. The fuzzy judgment is

$$\begin{aligned} S_i=P^i \cdot R_i &= [0.1098, 0.1052, 0.0449, 0.0631, 0.0841, 0.0981, \\ &\quad 0.0785, 0.0813, 0.0659, 0.0841, 0.0925, 0.0925]\ Ri \\ &= [0.6366, 0.5835, 0.6398] \end{aligned}$$

And, as a result, alternative 2—i.e., second registry—is the optimal choice for ship registry.

5.4 Reversing Chinese flagging out: Government intervention and policy competition

In China, as indeed in many other countries in the world, international shipping benefits the economy in ways far beyond the short-term commercial results of the shipping companies themselves. Unfortunately, despite a number of successful policy examples in many countries—especially in the European Union—China has thus far failed to realize that the provision of an attractive operational environment to shipping companies, and the pursuant improvement in the competitiveness of its flag, can generate multiplicative benefits to the state that would by far outweigh any costs (or foregone revenues) involved in the provision of such an environment.

5.4.1 The EU experience: Policy competition and the attractiveness of national flags

In most EU countries, the national register drain is continuing; this development is assuming alarming dimensions with painful consequences. To maintain a large and strong national fleet, most governments of traditional maritime countries have modified their policies, moving closer to the situation created by the legislation of open registers. The FOC legislation is often used as a benchmark against which to measure the effects of policies of traditional maritime countries (Veenstra *et al.*, 2000). In this way, "policy competition" is being developed between traditional maritime countries and open registers.

Usually, policy competition for attracting and retaining national fleets falls into two main categories (Raines, 1999): 1) an "incentive-based" approach, aiming to influence flag choice directly through such things as flag preference/discrimination (including cargo reservation), exclusion of foreign flags (cabotage, bilateralism, multilateralism), port

surcharges/discriminatory fees, and maritime subsidies such as operating and building subsidies, investment/modernisation grants, and tax benefits; and 2) a "rule-based" approach, which has a more indirect impact on flag choice by affecting the regulatory and operating environment of a ship owner. Examples comprise various special regimes with particular rules and regulations, putting national fleets on more equal footing with those of other countries (Sletmo, 1993).

The first approach has been used frequently in the past but has been unable to prevent the decline of national flag fleets. The second policy option became increasingly popular during the late 1980s; one of its manifestations was the establishment of what has come to be known as "international registries"—policy solutions aiming to reconcile private profitability considerations and national economic welfare.

At the level of the individual firm, the flag decision should be viewed as similar to any other strategic decision of the profit maximizing firm and should therefore be taken solely on commercial criteria. On the other hand, every national economy has to maximize its benefits from shipping. When evaluating the economic and social effects of flagging out, governmental authorities ought to consider its welfare effects on the overall economy. Policy solutions should result from such an evaluation. To this end, the second policy approach represents, at least theoretically, the best of both worlds by combining the advantages of FOCs with those of the traditional maritime countries. International registries should thus be viewed as the point where both the private interests of shipping companies and the wider ones of the national economy are reconciled.

Most EU countries have longstanding maritime traditions; in the last decade, the EU has developed a comprehensive and active approach to maritime affairs. By the 1990s, European "traditional" registers and seafaring employment had declined so precipitously that the EU had to reappraise its maritime strategy. The EU's response to the decline of European shipping in the face of international structural change in the industry was set out in its paper entitled "Towards a New Maritime Strategy" (Commission of the European Communities, 1996).

One of the main objectives of the revised policy was to ensure, through a community framework for enhancing shipping competitiveness, that ships were "...preferably registered in EU Member States with Community nationals employed on board". The competitiveness framework encompassed policies on training and employment, research and development, and state aid. As to the latter, the means by which member states could intervene in the market to encourage EU ship registration and employment were defined in the commission's maritime state aid guidelines (Community Guidelines on State Aid to Maritime Transport). The guidelines established a more liberal regime for shipping than in any other sector in the EU economy (Department of the Environment, Transport and the Regions, UK, 1998).

Examples of state aid in shipping can be found in most traditional maritime nations of Europe, from the early Norwegian initiative to the German package approved as recently as 1998. In these initiatives, common elements are fiscal relief measures such as tonnage-based corporate

taxation and the exemption of social charges for seafarers. A notable initiative is the comprehensive package of measures introduced by the Netherlands which, according to Dutch authorities, has succeeded in establishing the circumstances in which their maritime industry is now enjoying an economic recovery. The new approach of the Netherlands focuses on creating an attractive business and investment climate in which shipping is seen as the core of the country's maritime business cluster. The central element of the Dutch maritime initiative, reflecting the new focus on Dutch ownership rather than on the Dutch flagged fleet, is an optional tonnage-based tax regime. The new policy was introduced at the beginning of 1996. Results include a 25 percent increase in the Dutch merchant fleet, full employment of Dutch seafarers, a renewal of shipbuilding in local yards, and the return or relocation to the Netherlands of some 40 ship owning or ship management companies (Department of the Environment, Transport and the Regions, UK, 1998).

5.4.2 A proposed shipping policy for China to change the situation of flagging out

As noted earlier, policy competition and government intervention are becoming worldwide instruments to attract and retain national fleets. As such, China also needs to retain a strong Chinese presence in shipping and, where possible, a strong Chinese registered fleet to ensure the development of national economy and security. To this end, China should use the experience of developed maritime countries as a reference. This means that China will have to adjust its shipping policy, making it more appealing to Chinese ship owners and encouraging them to register their vessels domestically.

Zhang (1998) quantified and compared the protective (or openness) degree of shipping policy for typical maritime countries using an integrated Delphi and comprehensive fuzzy evaluation method. According to his results, as shown in Table 5-3, the present protective degree of China's shipping policy is not only lower than that of the US, but also lower than that of traditional open economies such as France and South Korea. This is consistent with China's general policy of economic openness and its aspirations within WTO. The country has already undertaken a series of important liberalization initiatives in shipping, including the abolition of preferential treatment of Chinese companies, cargo reservation, favourable interest rates for ship finance, etc. However, as far as the competitiveness and endurance of Chinese shipping companies are concerned, Zhang argued that the degree of openness of the Chinese shipping policy is over-advanced.

Table 5-3: Comparing the protective degree of shipping policy between typical maritime countries and China

Mean protective degree	USA			France			S. Korea			China		
	1982	1992	2000[a]	1982	1992	2000[a]	1982	1992	2000[a]	1988	1994	2000[a]
$\bar{P}$	0.85	0.71	0.62	0.81	0.56	0.16	0.75	0.59	0.25	0.88	0.14	0.59

[a]: Expected for typical maritime countries and suggested for China

Source: Zhang, P., Journal of Wuhan Transportation University (China), December 1998.

However, despite the openness of its economy, China is still a developing country requiring appropriate non-discriminatory policies in order to boost its international competitiveness, the shipping sector included. With regard to the latter, government policy should focus its efforts on expanding those activities that create the highest value added (Veenstra *et al.*, 2000). In certain traditional maritime countries, such as the Netherlands, shore-based maritime activities—most prominently shipping management—contribute most of the value added generated by the shipping industry. However, this is not the case in China, where activities such as multimodal transport, shipbroking, and insurance are far less developed. Shipping value added in China is generated by the ship itself; thus, any shipping policy should be geared towards attracting and retaining the national fleet.

The shipping policy in China, as in most other countries, should aim to level the playing field in international competition through such measures as fiscal relief, shipbuilding terms similar to those offered to foreign buyers, abolition or lowering of ship import tariffs and value-added taxes on international trades, waivers on social charges for seafarers, and tonnage-based tax regimes. In addition, the government should increase investments in maritime education and training in order to encourage the development of a skilled and flexible maritime labour force.

Finally, the possibility of establishing an international ship registry, as suggested in this paper, should be seriously considered, especially in order to attract those vessels that have already been registered overseas.

As mentioned earlier, international, parallel, or offshore ship registers, as they are often called, have been widely adopted in Europe. Their main objective is to level operating costs with those prevailing under FOC registration, while simultaneously maintaining high technical standards and effective implementation of international conventions. By also flying the national flag, ships in the parallel register enjoy a high reputation among shippers and charterers.

In the case of China, such a register should have the following characteristics: the type of vessels registered should be Chinese-owned (including domestic and FOC), the manning system should be eased and the required number of national seafarers reduced, and the taxation policy streamlined using the tonnage tax policies of other countries or FOCs. Such tax policies may include exemptions from tonnage dues, annual tax, and income tax by seafarers. A suitable reform of company and contract law to norms familiar to western ship finance banks would, at the same time, considerably facilitate and enhance financing possibilities (Yang & Haralambides, 2002).

5.5 Conclusions

In China, as in most other countries, flagging out has been shown to have serious negative impacts on national shipping development and the national economy. To change the situation, China has to adjust its shipping policy according to experiences in countries that have faced this unfavourable development earlier. Such policy reorientation should be based on the

evaluation of the economic, social, and political effects of shipping registry alternatives. China should adopt more preferential shipping policies, such as favourable shipbuilding arrangements, tax exemptions for ships in international trades, waivers of social charges on seafarers, tonnage-based corporate taxation, and greater support to maritime education and training in order to maintain skills and a flexible labour force. Finally, the establishment of a parallel registry, along the lines of the European experience, as suggested in this paper, would help in attracting Chinese-owned vessels.

Chapter 6 Strategic Positioning and Operational Restructuring for Chinese Transport Logistics Service Providers: A Perspective of Shipping Lines

Transport logistics service providers, which include shipping lines, freight forwarders, shipping/customs agents, rail/trucking companies, air freight companies, port/terminal operators, DC/inland depot operators, and third- and fourth-party logistics providers, are the principal players in a logistics chain. In this respect, without qualified transport logistics service providers that are able to provide high-level integrated logistics services, China's transport logistics industry could not expand in order to meet the need for value-added logistics services to both national economy at the macro level and to customers/shippers at the micro level. Just as the transport logistics industry itself, Chinese transport logistics enterprises are still in their infancy compared to their international counterparts. To this end, an effective cultivating mechanism, that will provide a way to foster and nurture leading logistics providers with the best practices, should be set up to promote the growth of Chinese transport logistics enterprise and industry. Foreign companies, which have rich experiences in logistics best practices and advanced logistical management skills, should be introduced to the transport logistics sector through partnerships, alliances, mergers, and acquisitions. By adopting various effective approaches, the innovative cultivating mechanism of leading transport logistics enterprises will be formed and increasingly perfected, thereby speeding up the transition and promotion of Chinese transport logistics enterprises (Yang, 2007). In this context, this chapter examines the evolving role and position of Chinese transport logistics service providers, from the perspective of shipping lines, as well as their operating models, based on best practice experiences of their foreign counterparts.

6.1 The evolving strategies of shipping lines in the changing logistics chain: A literature review

Trade liberalisation, helped by the significant developments of transport logistics and ICT, has drastically weakened the link between manufacturing and the location of factors of production and has stimulated a most noticeable shift in manufacturing activities towards countries with comparative advantages (Haralambides, 2002). The fast-growing globalization and outsourcing have significantly changed the operating environment in which maritime transport is situated. With an increasing variety of consumption patterns and flexibility of production, the need to have logistics systems for the swift and reliable flow of goods and information has become pressing for the growth of firms and the national economy (Evangelista *et al*., 2000). Satisfaction of this need has led to the development of a considerable market for logistics services, not only in traditional industrialized countries, but also in the prosperous developing economies such as China. In particular, the latest outsourcing trend, in which manufacturers look for global logistics packages rather than just

straight shipping or forwarding, has opened new windows of opportunity for shipping lines and encouraged most of them to transform into intermodal logistics organizations (Notteboom *et al*., 2001). In the most advanced stages of this evolutionary process, the transformation of the role of large global carriers towards this of TPLs is taking place as a result of them supplying a series of value-added logistics services in addition to transport (Evangelista *et al*., 2000).

Within this changing context, the major Chinese groups operating in liner shipping services such as COSCO, China Shipping, and Sino-trans, have shown signs of great activity. Although focusing mainly on the shipping phase of transport, they have shifted their attention from a port-to-port approach to one of door-to-door, so as to provide a service that better meets customer needs. In addition to transport, they have also implemented strategic choices to engage in warehousing, distribution, and other logistics activities aimed at achieving greater control of the total supply chain.

Maritime transport is at the core of global freight distribution in terms of its unparalleled physical capacity and ability to carry freight over long distances and at low cost. With the convergence of ocean transportation and logistics, carriers are more closely related to the requirements of their customers, in terms of price, timing, frequency, and level of service (Rodriguez *et al.*, 2007). In this context, Panayides (2006) argues that, in liner shipping, and from a carrier's perspective, there has been an evolution of practices and research, from the traditional approach of exploring the sea-leg and solely maritime operations, towards the creation of liner shipping networks; value delivered to the customer; and application of logistics concepts. Over the past few years, a significant amount of academic literature has appeared, emphasizing the impact of changing logistics on the maritime industry and the strategic positioning and role of shipping lines in customers' logistics chain management.

Evangelista *et al*. (1999) explored how shipping lines responded to the changing environment through alliances and found that most of the alliances examined were concentrating on the maritime transport leg rather than on inland transport and logistics activities—i.e., on vertical integration. By using factor and principal component analysis to assess the degree of importance of a large number of service attributes and a small number of underlying dimensions called strategic factors of carriers (agencies), Lu (1999) examined logistics services and strategic dimensions in Taiwanese maritime firms; the results revealed that the most important strategic dimension (factor) was value-added services, followed by promotion, equipment and facilities, as well as speed and reliability. In light of the major changes underway affecting the shipping industry, Evangelista *et al*. (2000) outlined the role of (Italian) shipping firms in the logistics service market; the analysis showed that, in addition to the skills required to integrate oneself within the logistics chain of customers, the (Italian) shipping firm ought to tackle complex internal logistics problems to ensure continuity (endlessness) of freight flows, a dimensional level compatible with achieving economies of scale, and an acceptable level of concentration.

While maritime transport is focusing on providing the most extensive services possible within

expected cost and reliability parameters, ports are hard pressed to act as efficient nodes in global logistical chains, in a context of flexible maritime networks. Their responses have involved establishing better hinterland connections (Rodriguez *et al.*, 2007). A number of works have addressed logistics integration and the changing role of ports and port authorities in the new environment (e.g., Panayides, 2006; Heaver *et al.*, 2000; Notteboom *et al*., 2001; Robinson, 2002; Bichou *et al.*, 2005). Heaver *et al.* (2000) examines various forms of cooperation agreements among carriers and ports in Europe, including alliances and mergers among shipping lines; conferences; involvement of shipping companies in terminal management; extending interests of carriers in inland transport, and the consequences of this evolution on the market structures in which ports and shipping companies operate. In their research, they paid specific attention to the competitive position of the port in this new environment, arguing that the role of ports and port authorities has to be redefined to guarantee that it remains a competent player in this fast-evolving integrated market. Notteboom *et al*. (2001) discuss the impact of some structural changes in international trade, transport, and shipping (such as demand for network-centric integrated logistics services) on strategic and operational issues of port management. They assert that a successful port (authority) must be prepared to constantly adopt new roles in order to cope with the changing market environment. Robinson (2002) argues that the role of ports and port authorities—and the way in which they position themselves in the new business environment—must be defined within a paradigm of ports as elements in value-driven chain systems, not simply as places with particular, if complex, functions. Bichou *et al.* (2005) examine the role of ports in the integration of three types of channels: logistics, trade, and supply chain management.

Historically, the demand for shipping services has been solely considered as a derived demand originating from the transport needs of the products themselves. However, in past decades, the derived nature of demand for shipping has evolved from a demand for the possession of goods to an integrated demand for the possession of goods that have added value and are timely, reliable, and cost-efficient. The nature of integrated demand for maritime transport gives rise to the new concept of maritime logistics (Panayides, 2006). Maritime logistics provides the methodological tools to support decision-making on such questions as how shipping companies allocate and schedule their containerships; manage their containers; have access to specific port terminals and inland transport systems; and perform a range of value-added activities (Notteboom, 2006), which normally include palletising, product assembly/installation, bulk breaking, consolidation, packaging/repackaging, procurement, quality control, labelling/re-labelling, testing, etc. Maritime logistics is thus becoming closely integrated with inland logistics. In this context, strategies and operating models in the shipping industry have evolved in an effort to meet the requirements of maritime logistics. Heaver (2001) summarizes a general framework of logistics strategies for shipping lines (and transport companies), adjusting to the changing operating environment, as shown in Figure 6-1. In this framework, the responses of shipping lines to the new challenges are placed in three interactive categories, each linked with a specific strategic direction. First, to meet the increasingly global needs of shippers for access to suppliers and markets while using a reduced number of (leading) carriers, shipping lines are under pressure to increase the spatial extent of their services through horizontal integration (e.g., alliances) strategies. Second, as

shippers seek to integrate and improve the performance of their supply chains, carriers face issues about the range of logistics services to be provided to meet shippers' needs, and the level of organizational integration needed for their various services. Finally, while offering quality logistics services to shippers and maintaining market share, carriers need to find ways to keep or reduce their cost levels. This demands new efforts to achieve economies of scale and scope—key dimensions of a business in any network industry (Heaver, 2001).

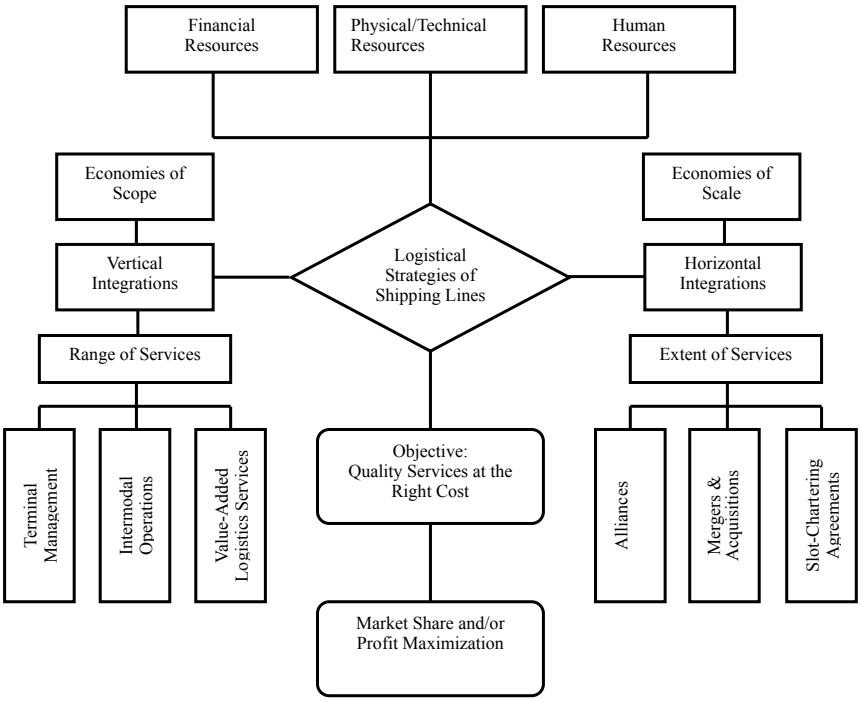

Figure 6-1: Framework for the logistical strategies of shipping lines
Source: Adapted from Heaver, 2001

6.2 Logistics practices of foreign shipping companies in China

Driven by more open domestic freight distribution channels and immense growth opportunities in China, particularly as foreign investors and MNCs shift their emphasis from export-oriented production to serving the domestic (central and western area) market, world-famous logistics and shipping enterprises have quickened their paces to enter into China so as to share in the increasingly growing logistics market. The number of foreign deep-sea shipping lines has increased rapidly in the Chinese logistics market over the past decade. Companies such as APL, Maersk Line, OOCL, and Mercantile (China) Logistics, which have been awarded logistics licenses from the Chinese government to offer their

customers a full range of cargo management, freight transport, and distribution services throughout China, have set up or are planning to establish their own distribution networks in China aimed at developing value-added freight services on a regional/local basis. As a result, there has been a clear focus on establishing representative offices and/or appointing agents in the interior cities, such as Chongqing, Chengdu, Xi'an, Wuhan, and Kunming, in order to serve the potential logistics market in China's central and western provinces/cities.

The logistics practices of foreign carriers can be grouped by three aspects (discussed below), according to their strategies as advertised in their public statements and published reports. However, conclusions remain tentative for various reasons. The practices of lines and the reasons behind them may be confidential so that inferring strategies is speculative (Heaver, 2001).

Expanding the service network

The extent of the network is an increasingly important service attribute to enable shipping lines to meet the changing logistics needs of shippers (Heaver, 2001). Compared with their Chinese counterparts, foreign shipping companies have less control over the service network to meet the "door-to-door" requirements of their shippers in the Chinese market, especially those located in the hinterland. In this respect, foreign shipping companies that have established a leading presence in the Chinese maritime transport sector have devoted themselves to extend their service network to connect the main seaports and hinterland in China.

In 1996, APL became the first foreign deep-sea ocean carrier to be granted Wholly Owned Foreign Entity (WOFE) status. Since then, the company's liner service network to/from Chinese ports has expanded enormously, and the company has also created one of the most extensive sales and marketing networks in China. Based on its nationwide network, APL has successfully expanded into land-based transport activities and is a regular user of rail, truck, and inland waterway services.

OOCL's strategy has been similar to that of APL's. The Hong Kong headquartered operator has expanded the number of liner services calling directly in China, opened additional sales and marketing offices, and placed considerable emphasis on its value-added intermodal and IT capabilities. OOCL has located its China headquarters in Shanghai, opening another 21 offices throughout the country. Its domestic operation OOCL (China) Domestic Ltd. was established in 1998. OOCL Logistics and OOCL (China) Domestic Ltd. now operate from 10 offices, including Shenzhen, Qingdao, Nanjing, Tianjin, Dalian, Xiamen, and Shanghai, and provide a full array of inland transport, consolidation, storage, and customs clearance services. Full track and trace facilities are available to its customers, while—to ensure efficiency in the supply chain—OOCL has secured dedicated warehousing space in the main cities in which it operates.

Since 1998, Maersk Logistics (China), also headquartered in Shanghai, has expanded its office network considerably, the most recent efforts being directed at improving its coverage

of the interior (e.g., in Harbin). The company was granted licenses from the MOC1 to convert representative offices in Chengdu, Chongqing, Dalian, Nanjing, and Ningbo into branch status. Since opening its first distribution centre in Shanghai, the company's network has spanned 14 branch offices and 2 representative offices, as shown in Figure 6-2. Moreover, management is viewing opportunities in several other locations (www.jctrans.com, 2005).

Figure 6-2: The service network of Maersk Logistics in China
Source: www.maersklogistics.com, 2007

Since Zim Logistics (China) Co. Ltd. opened its first branch office in Shanghai in spring 2002, it has pursued an aggressive expansion program. At present, the company has established a direct presence in Qingdao, Xiamen, Beijing, Nanjing, Guangzhou, and Shenzhen.

NYK Lines (China) has also established a branch in Shanghai, and is now moving to set up logistics companies in Tianjin, Qingdao, Fuzhou, Xiamen, Guangzhou, and Dalian.

Seeking strategic alliances with local logistics service providers (LSPs)
In order to control their logistics activities more closely, a number of foreign shipping companies have established alliances with local companies, something that has also enabled carriers to expand their geographic span and market coverage. APL has formed joint venture companies with two local transport giants in Shanghai and Shenyang to develop the mainland logistics market. For instance, in order to expand into Chinese land-based transport activities, APL concluded deals with state-owned Eastern China Railway Express and Shenyang Transportation Group. The latter company operates trucking services in northeast China. APL Logistics has currently branch companies in 10 cities around China's north, central, and south regions.

By teaming up with Chinese partners in offering TPL services, Mitsui OSK Lines (MOL) of Japan and Fuji jointly operate a logistics and warehousing company in Suzhou to take care of all the logistics involved in making the Fuji film available across the China market.

As a means of strategic alliance, the concept of joint venture with local LSPs has been highly successful and adopted by many foreign shipping companies. This joint venture concept has

given OOCL an already significant presence in various sectors of China's transport and logistics sectors. OOCL has been cooperating with the MOR (Ministry of Railway, China) since the mid-1990s and has one of the most extensive block-train networks of any shipping company operating in China. OOCL has also worked closely with the MOR and its specialist container division (CRCTC) to promote the carriage of perishable products in containers by rail for the Chinese domestic market. In this context, OOCL is the first company to move refrigerated containers by rail; since 1998 it has been offering regular reefer-on-rail services on several corridors, such as between Xi'an and Qingdao as well as Chengdu and Shanghai. Although rail is important for OOCL in moving its marine containers to/from the interior, it is not the only option used. In fact, OOCL is a major user of barge and river services in both the Yangtze River and Pearl River delta areas and has signed a number of exclusive slot-purchasing arrangements with local barge companies. This strategy has served OOCL well as it has developed long-standing relationships with local experts, resulting in its having a much greater understanding of the challenges facing inland transport in China.

Like OOCL and APL, Maersk Logistics has developed special software and IT systems to meet the requirements of its customers; it has a full Chinese version of its website up and running. Despite the significance of the software, Maersk Logistics operations in China are complemented by investments and strategic alliances in more traditional sectors, such as trucking and warehousing. Maersk Logistics is keen to exercise greater control over its storage and warehousing activities and sees the development of modern facilities that allow activities such as picking and packing, labelling, light assembly, and processing to take place as being of growing importance in China's emerging economy. Hence the company is planning to develop further vertically integrated distribution centres at key locations, such as Dalian, Tianjin, Shanghai, Ningbo, and Xiamen, throughout China.

Developing new roles and value-added logistics packages

The slow development of logistics services in China has been attributed to both a lack of understanding of the industry and insufficient investment in software/IT. In China, logistics has been viewed simply as storage and transport. In this respect, foreign shipping giants play a role in teaching Chinese transport logistics service providers and their customers (shippers) as well as administrative agencies to understand modern logistics concepts and operations. In this respect, Mercantile (China) Logistics Service Company has made consistent efforts (time and money) not only educating and developing the supplier base in China, but also increasing awareness within government bodies. The company maintains the same standards and quality of service in China as it does in the US, Europe, and elsewhere. Such commitment will allow China's transport market to meet the changing needs of its global customer base.

In 2000, P&O Nedlloyd, now part of Maersk Line, secured permission from the government to expand its network, which had previously been focused on Shanghai. The company is working on integrating China's distribution systems into the international shipping routes. On the export front, consignees in the US and Europe increasingly want consolidation to take place in China; this is creating a need for better warehouses and the installation of bar coding, inventory controls, etc. On the import side, the market is being fuelled by shippers wanting to

hold stock in bonded warehouses, thereby being able to release goods as soon as orders are placed, and the increase in shipping oversize equipment and project cargo. However, PONL (Maersk Line) as well as other foreign shipping lines such as OOCL, also see growth opportunities in this sector. There is considerable building work going on in China at this moment, with project cargo, such as construction equipment, transformers, and boilers being moved in increasing volumes. These require tailor-made transport solutions (Yang, 2007).

While global shipping lines have actively played a role in the Chinese transport logistics sector, large global forwarding companies, such as Danzas, Panalpina, Kuehne & Nagel, and Jardines, are also putting more resources into developing value-added logistics packages that can be used for the growing domestic market. Hong Kong-based U-Freight was the first foreign-controlled forwarder to obtain a full Class 1 operating license, which allows foreign forwarders to be involved in domestic distribution services for its satellite terminal at Qingdao. This new office is an important addition to its network of freight and logistics in China. Securing the Class 1 license will help the company improve traffic volumes considerably. U Freight-China Express, which offers customers a full range of air and sea freight services in the area, supports this with a comprehensive delivery and pick-up service.

6.3 The characteristics of Chinese shipping lines from a logistics perspective: Strengths and weaknesses

Following trends in international maritime transport, "logistics" has been one of the most fashionable words in Chinese shipping circles in recent years. Some shipping lines have even set up advanced internal logistics systems integrating with the other stages of the transport chain. As the logistics demand presents new characteristics and content, the approach of Chinese shipping lines to logistics should be examined properly, taking into account that, with China's entry into WTO, the most significant foreign shipping and logistics giants—such as those previously mentioned—are and/or have been infiltrating into Chinese shipping logistics market by setting up joint ventures or acquisitions to achieve competitive positions in Chinese logistics and transport services. To gain competitive advantage in such a dynamic market environment, Chinese shipping lines need to restructure their operation processes and organization according to shippers' integrated logistics service requirements. This could be achieved by using the best practices of their international counterparts based on their own actual conditions (advantages and weakness).

However, the Chinese shipping industry has traditionally maintained a structure deeply imprinted by the planned economy and "the widespread existence of entrepreneurial mentality loath to accept change, and, thus very often unprepared to face an increasingly complex competitive environment, a wide scope of business and a high level of risk" (Evangelista *et al*., 2000). The traditional thinking of "self-reliance and self-sufficiency" of Chinese manufacturing firms that hinders the outsourcing of logistics activities, and transport policy that made no provisions for improving the developmental environment for Chinese shipping industry should be the main factors resulting in these structural features. Under these

developmental circumstances, Chinese shipping logistics demonstrates the following characteristics.

Deficiency of shipping infrastructure

The infrastructure of the Chinese shipping sector has long been a bottleneck due to insufficient investments in the construction of waterways (inland waterway and access channel to seaport). Port infrastructure has lagged behind economic and trade developments. The main element significantly contributing to this situation is a Chinese transport infrastructure investment policy that has long favoured rail and road transport, "but has not adopted the necessary systematic approach required by the ever-increasing role of intermodal systems and integrated logistics" (Evangelista *et al.*, 2000).

With respect to the construction of inland waterways, the total length of China's inland waterways in 2005 amounted to 123,300 kilometres, of which classified waterways make up only 61,000 km. Among these, waterways of Class III and above (accommodating vessel loads of up to 1000 tonnes) reached 8,631 km, accounting for 7 percent of the total; Class V and above waterways (which can handle vessel loads of up to 300 tonnes) reached 23,659 km, accounting for 19.2 percent of the total. The shares of each class of waterway in China's overall inland waterways are shown in Figure 6-3 (MOC1, 2006). China has large navigable rivers, especially in central and southern China, that link many of its major cities. Moreover, China's geography and the location of its population are exceptionally favourable for inland water transport. These features create the potential for inland water transport to claim an important share of China's transport market, which make up 5.8 percent of freight in tonnes and 3.4 percent of the freight tonne-km. For instance, approximately one third of China's inland/coastal freight is moved on the Yangtze River system. The Yangtze corridor has been targeted as the main transport artery for the West. Nevertheless, the limited water depth prevents safe year-round access by vessels with capacity of more than 100 tonnes (Goh & Ling, 2003). Fortunately, the government has realized the advantages of inland water transport: relatively low cost and less impact on the environment than rail or road transport. In recent years, the government has been increasing investment in waterways to deepen navigation channels and upgrade navigable aids, such as telecommunication facilities and navigation markers.

As regards port infrastructure, China had 35,242 berths in all (mainland) ports at the end of 2005, of which only 1,034 berths had a handling capacity of 10,000 tonnes/per?. In this respect, the shortage of large, deep-water berths along coastal ports and the deficiency of specialized wharves for containers, ores, and crude oil in particular have been highlighted. The insufficiency of port handling capacity has been causing overloaded operations of large key ports, such as Shanghai and Shenzhen. In 2005, port throughput in mainland China reached 3.38 billion tonnes, which was much greater than its port handling capacity of 2.52 billion tonnes (MOC1, 2006). Despite the impressive increase in containers handled, mainland China's ports still cannot handle the large volumes with ease, as port infrastructure is below international standards. For instance, pavement strength usually allows a maximum stacking of three high, half the norm in most developed ports, such as Hong Kong. Despite a

global trend to use larger containerships, many Chinese ports cannot accommodate such vessels. Hence, it is crucial that plans be made and implemented to ease the congestion related with such high cargo volumes and to cater for larger vessels. China is also beginning to handle more goods with hazardous components. By 2005, the movement of hazardous materials amounted to 0.3 billion tonnes, accounting for 10 percent of total sea freight (Li *et al.*, 2007). As yet, China does not have sufficient infrastructure and expertise to handle these materials well. Safety measures are still insufficient, workers are inexperienced, and even shippers may not have a thorough understanding of the materials they ship (Goh *et al.*, 2003).

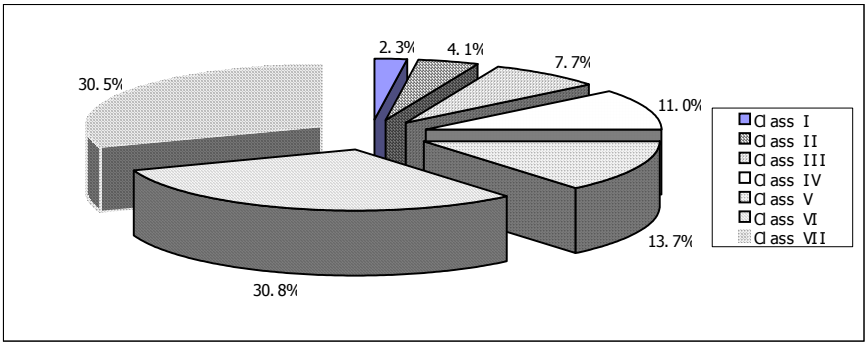

Figure 6-3: Distribution of classified inland waterways in China, 2005
Source: China's road and water transport communiqué, 2005; MOC1, 2006

Compositional feature of tonnage supply

Over the last 20 years, the capacity of the Chinese merchant fleet (inland waterways, coastal, and deep-sea) has developed along with the fast growth of the Chinese economy (Table 6-1). However, the supply of tonnage presents a compositional feature; while the supply of old, outdated, and small conventional ships outweighs demand (as shown in Figure 6-4), the supply of new, modern, and large specialized vessels, such as containerships, refrigerated carriers, LPG/LNG carriers, and Ro-Ro ships, remains inadequate for meeting the fast-growing requirements for transporting specialized cargo (such as frozen food, fresh vegetables/fruits, livestock, chemicals). Taking refrigerated carriers as an example, China had 109 reefers in 2002 (Zhu *et al.*, 2003), with a total capacity of 137,553 dwt. Among them, 52 reefers have the capacity of less than 1,000 dwt. The average tonnage of the reefer fleet is just 1,418 dwt, and the average age of the fleet is around 23 years—much greater than that of the world average (5,480 dwt and 20 years, respectively). The same situation can be observed in China's LPG carriers. At the end of 2005, China controlled 64 LPG carriers; among them, only 13 LPG carriers had a capacity of more than 3,000 cubic meters. The remaining 52 LPG carriers all held less than 3,000 cubic meters, accounting for 62.5 percent of the total LPG fleet. Also, 57 percent of the LPG fleet was more than 20 years old, and 46 percent were more than 25 years old (Current situation and prospects of China's chemical shipping, Wenhuan *et al.*, Water Transport Management, 2007).

Apart from the fast development of other modes, especially road transport, shifting some cargoes previously carried by ships, and the government's failure to develop policy to control the old capacity expansion and foster the development of new hi-tech vessels, should be of primary concern in addressing the current situation.

Table 6-1: Fleet structure in China (as of 2006)

	Total Capacity			Operating in					
				Deep sea		Coastal trades		Inland waterways	
	2006	2005	Increase over previous year (%)	2006	2005	2006	2005	2006	2005
Number (1,000)	194.4	207.3	-7.2	2.2	2.0	9.2	9.3	183	196
Deadweight (Million tonnes)	110.257	101.786	8.3	38.299	36.494	22.535	20.478	49.423	44.815
Container capacity (1,000TEU)	928.0	807.0	15.0	763.0	670.0	102.0	85.0	64.0	53.0

Source: MOC1, 2007; Shanghai Shipping Exchange, 2007

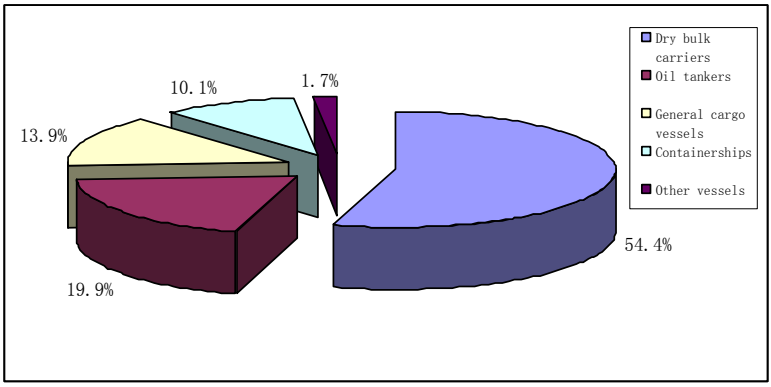

Figure 6-4: Chinese-controlled fleet distribution by type of ship, 1 January 2007

Source: UNCTAD, 2007

As China's merchant fleet continues to grow, the number of Chinese-owned vessels registering overseas and flying foreign flags has also increased, accounting for 50 percent of the total international shipping tonnage of China (UNCTAD, 2006). Just as discussed in Chapter 5, the flagging out of the Chinese-owned vessels has negative impacts on the healthy development of the country' shipping industry and national economic security. It affects the control of the country over the safety of the vessels, induces sub-standard shipping, poses potential risks, and is also detrimental to the protection of the legitimate rights and interests of Chinese seafarers.

Inefficient administrative system

The shipping administration system of China has five layers, from central government to township governments (Luo, 2000), with differences in the scope and interests between central and local government. This leads to a doubling of standards and regulations, which are often not well coordinated, as well as to sector protectionism and local protectionism, which typically hamper the development of integrated logistics. Moreover, although the environment and mechanisms of the shipping industry have changed, government administrative bodies have not yet correspondingly got rid of outdated management concepts. Unfortunately, while the direct macro-administration mechanism is no longer useful for changing the transport logistics scenario, the indirect administration mechanism is not yet ready. Under this situation, together with the shortage and barriers in the enforcement of shipping laws and regulations, the state-owned shipping firms cannot effectively compete in the logistics and shipping market, although they have great advantages in equipment, technology, and capital.

In a changing logistics and shipping context, every Chinese shipping firm, whether large, small, or medium-sized, is facing the challenge of how to deal with the drastic competition coming from foreign logistics and shipping enterprises. Since 1990, world-famous logistics and shipping enterprises have quickened their pace to enter China and share in the increasingly growing logistics market. For Chinese shipping lines, their foreign counterparts possess great comparative advantages in terms of overseas networks; logistics know-how; etc. (Table 6-2). However, inadequate network and coverage in China and high operating costs create weaknesses and disadvantages they cannot overcome in the short run.

Table 6-2: Strengths and weaknesses of domestic and foreign shipping lines in China

	Strengths	Weaknesses
Domestic shipping lines	■ Wide domestic services network, especially for large shipping lines ■ Plenty of transport and storage facilities ■ Good relationship with central and local government and domestic shippers ■ Low operation costs	■ Low productivity and efficiency ■ Lack of advanced technical and managerial skill in logistics operations
Foreign shipping and logistics firms	■ Wide overseas services network ■ Abundant logistics know-how and practice experiences ■ Good relationships with international customers ■ Advanced IT system ■ Strong financial support from the headquarters	■ Inadequate network and coverage in China ■ High operation costs ■ Less strong relationship with central and local government

Source: Zheng & Yang, 2002

Hence, as soon as Chinese shipping and logistics lines overcome their weaknesses of low productivity and efficiency by improving technical and managerial skills in logistics services—as well as take full advantage of their strengths—they will be able to compete with

their foreign rivals.

6.4 Strategic positioning and operational restructuring of Chinese shipping lines in a logistics chain

There is no doubt that with China's booming economy and trade its freight distribution market is stretched almost to a breaking point. However, a combination of liberalization and initiatives from the private sector can update the network and enable a more efficient distribution and supply chain management system to ensue. Under pressure coming from a changing distribution system as well as the competitiveness of foreign shipping companies, China's state-controlled shipping lines have also been forging ahead with their own logistics operations. The shipping lines are operating in a very competitive environment, and with China's liberalized trading environment, they have to improve and offer the same logistics services as those offered by their foreign competitors.

By comparison, the different sizes of shipping lines and types of LSPs present a different position in a logistics chain than TPLs (Figure 6-5). The large shipping companies can play a vital role in providing broad ranged, integrated, customized, and value-added logistics services through vertical alliances with terminal operators, inland multimodal transport operators, or even with logistics centre/district park operators. In the comprehensive logistics sector, they have to compete with specialized LSPs, forwarders, and non-vessel operating common carriers (NVOCC). Carriers can do this by taking advantage of their control of the maritime transport leg, transport networks, and relationships with customers (shippers).

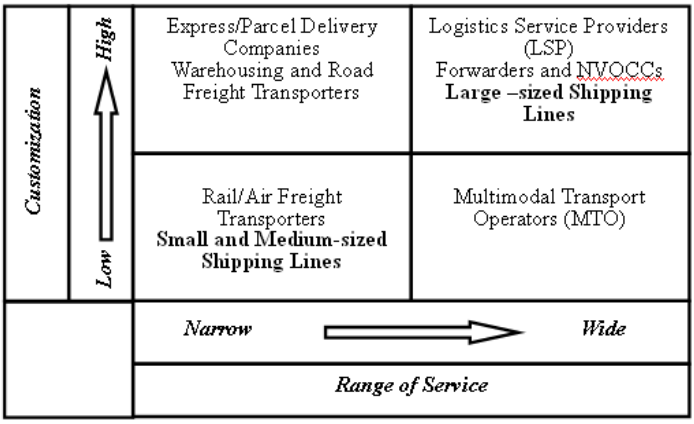

Figure 6-5: Positioning of Chinese shipping lines in logistics and transport service market
Source: Adapted from Evangelista *et al*., 1999

According to their strategic positions and roles in the changing logistics chain, Chinese shipping lines have focused on restructuring their shipping and logistics operations. In general, operational restructuring is the process of increasing the economic viability of the underlying

business model. Examples include mergers, the sale of divisions or abandonment of product lines, or cost-cutting measures such as closing down unprofitable facilities. Actually, in the past few years, China's large state-owned shipping companies (SOEs), such as COSCO, China Shipping, and Sinotrans, together with medium-sized and small shipping companies have taken steps to restructure their operations and play active parts in a logistics chain by leveraging their strengths in facilities, existing presences, human resources, low costs, and service networking.

Creating competitive advantage for large Chinese shipping lines through logistical operations restructuring and cooperative strategy

Large SOEs such as Sinotrans, COSCO and China Shipping have massive asset positions and strong relationships with traditional SOE manufacturers and other local enterprises All have initiated plans to transform themselves from providers of basic services, to suppliers of value added third-party solutions (McKinsey & Company, 2001). For instance, COSCO established its subordinated logistics company "COSCO Logistics" by reorganizing its logistics resources in the beginning of 2002. This marked the beginning for COSCO to provide integrated logistics services to its customers and it also brought about a profound influence in Chinese shipping. Using COSCO Logistics as a model, China Shipping, Sinotrans, and other shipping companies have also set up their own logistics subsidiaries to provide tailored logistics services to shippers as TPLs. The existing advantages of large SOEs make them formidable competitors. But compared to their foreign rivals, as mentioned above, their ability to offer value added services in a cost-effective and efficient way on their own is very limited, making them receptive to partnerships and other cooperative arrangements with leading foreign third-party logistics companies who have real technical, operational, and solutions know-how. They may also view potential foreign partners as sources of capital.

From an LSP perspective, Sinotrans is in a strong position and has genuinely evolved into a transport service group capable of offering efficient and complete transport logistics services for all import and export cargo. The setting up of the Sinotrans Container transport network, both at home and overseas, to connect feeders and mainline, river, and ocean transport as well as sea, land, and air transport gives it a good position on the logistics front. As such, Sinotrans is probably best placed to offer a full range of transport and logistics services. Its status as China's largest freight forwarding company, second largest shipping agent, and third largest shipowner—plus its significant presence in the trucking, warehousing, distribution, and express/mail market—means that it can offer customers any service that they require (Zheng *et al*., 2002). The company also has the advantage of being able to integrate its domestic and international business, which enables various economies of scale to be exploited, thereby maximizing asset utilization and raising overall operating efficiency. Indeed, the company has progressively moved in to the value-added sector and now has a number of clients, largely in the IT, telecommunications, and automotive sectors, to whom it provides highly integrated supply chain management solutions. It already offers online cargo tracking and tracing, electronic booking, stock management, and purchase orders for shippers. Sinotrans is keen to expand further in this area; consequently, it is investing heavily in new IT systems and is looking at and evaluating various new Internet-based initiatives (Yang, 2007).

COSCO is another typical LSP within the Chinese shipping industry. Its approach is very similar to its international rivals. The company is looking at a number of options that will enable producers and consumers to use COSCO as their one-stop shop. With manufacturers increasingly outsourcing their transport needs, it is important that COSCO emerges as the supplier of their logistics services. The momentum to reorganize logistics services has gained great potential for the shipping giants of China in the logistics chain. In addition to becoming involved in terminal operations, COSCO has also established strategic alliances with domestic inland road/rail transport firms and foreign shipping companies with an aim to control the whole logistics chain. In 2004, COSCO Logistics controlled more than 500 service agencies, covering 29 provinces of mainland China, and possessed more than 1,000 vehicles, some of which furnished with GPS, as well as 15.4 million square meters of DC/CFS and warehouses (Ye Jia, 2005). Apart from its involvement in terminal operations, COSCO Logistics has also co-operated closely with domestic inland transport firms and about 40 foreign transport companies by agreement (including opening up 6 rail container freight liners linking inland hubs and key seaports allied with Chinese railway companies) to build functional links between strategically important ports and demand-generating centres. Meanwhile, the company has established offices in key manufacturing, consuming, and transport distribution hubs, including Dalian, Beijing, Qingdao, Shanghai, Ningbo, Xiamen, Guangzhou, and Wuhan. Based on its capability for integrated logistics, COSCO Logistics has gained competitive advantages in the Chinese logistics market. Some industrial giants in China, such as Qinchuan Nuclear Power Station, Shanghai GE Auto Co., Three Gorges Engineering Co., and Changhong Electrical Appliance Co., have outsourced their logistics services, including their supply of raw materials (parts) and/or distribution of products, to COSCO Logistics. The logistics subordinate of COSCO is currently adopting some of the latest software in supply chain management aiming to provide an Internet-based transaction platform for all of its logistics operations (Zheng *et al*., 2002).

China Shipping Group is also developing a string of logistics services and, in the spring of 2002, it set up a special unit, China Shipping Logistics, for the purpose of offering efficient logistics operations. Reportedly, the company has budgeted approximately US$420 million for this project, with most of the capital earmarked for expanding its fleet of trucks and setting up at least eight sales/marketing and operational offices.

Focus strategies of small and medium-sized Chinese shipping lines

In Porter's Generic Strategies (1985), "focus strategy" is defined as offering a specialized service in a niche market. Companies that use focus strategies well concentrate on particular niche markets and, by understanding the dynamics of that market and the unique needs of customers in it, develop uniquely low cost or well-specified products/services for the market. Because they serve customers in their market uniquely well, they tend to build strong brand loyalty amongst their customers. Compared to the large-sized shipping lines, China's small and medium-sized shipping companies have to focus mainly on the shipping phase of transport logistics and mostly serve local (niche) markets.

Shippers' demand for logistics services is diversified in China. In this context, blindly transforming into integrated logistics service providers is not a wise approach for the small and medium-sized shipping lines in the logistics chain. Due to constraints in facilities, networking, and management competence, the logistical services provided by the small and medium-sized shipping enterprises are simple and basic. Therefore, these companies sould emphasize either cost-minimization (Cost Focus) strategies or pursue strategic differentiation (Differentiation) within a focused (niche) market. They will find their position in the market based on their logistical competences in one of two ways: by joining an alliance of large shipping companies as suppliers of transshipment and feeder services or by cooperating with specialized LSPs to provide designated shipping services (Zheng *et al*., 2002).

6.5 Conclusions

The concept of outsourcing logistics services to TPL is not very acceptable in Chinese manufacture/business cycles; in particular, SOEs have not yet realized the importance of using TPL (CASW, 2002). This situation shows precisely that a great demand potential exists in the Chinese logistics market. In this market, the role and position of the Chinese shipping industry have to be defined in light of their strengths and weakness.

To gain competitive advantage in such a dynamic market environment, the Chinese shipping industry has promoted the restructuring of services and organization. The industry also needs to explore proper logistics development models in light of customer demand. To this end, Chinese shipping and logistics companies must vanquish their weakness of low productivity and efficiency by improving technical and managerial skills and by taking full advantage of their strengths. The latter include extensive domestic service networks, especially for large shipping firms, plenty of transport and storage facilities, good relationships with central and local government and domestic shippers, and low operating costs. Otherwise, they will not be able to compete with their foreign rivals in the competitive logistics market. Actually, in the past few years, China's large state-owned shipping companies (SOEs), such as COSCO, China Shipping, and Sinotrans, together with medium-sized and small shipping companies have taken steps to restructure their logistical operations and play active parts in supplying value-added third-party logistics solutions by leveraging their strengths in facilities, existing presences, human resources, low costs, and service networking.

Chapter 7 An IMG Model for the Chinese Transport Logistics Market

Compared to the traditional freight transport market, the (transport) logistics market of China is still in its initial stages. It is of great importance in such an immature market to establish an effective market information monitoring and guiding (IMG) system to put it on the right track in its initial development. For the purpose of achieving an effective information monitoring and guiding mechanism between the market and the principal of macro regulation and control (government), it is necessary to structure an IMG model for the Chinese transport logistics market. In this context, this chapter, based on the early warning theory and practice, seeks to examine the IMG framework, which includes the theoretical foundation for the establishment of IMG, the IMG organization and operation mechanism, and the IMG prosperity index models as well as the applications of such models.

7.1 Introduction

An effective market information guiding system plays an important role in ensuring that market economies function orderly. In the information guiding system an economic prosperity index (EPI) is often used to monitor the economy (Yang *et al.*, 2007). The index quantifies several economic variables to indicate the degree of fluctuation and economic trends—usually called the "barometer". Since the 1970s some market economy countries (e.g., the US, France, and Japan) have successively established monitoring and early warning systems of economic prosperity. Their periodically published EPI has become one of the most efficient tools in monitoring the national economy and in simplifying resource allocation and decision-making (Zhang *et al.*, 2001). In recent years, the EPI has also been increasingly used in China along with the growth of the Chinese market economy, turning into a basis of and tool for policy formulation and decision making for Chinese governmental agencies and industrial enterprises, such as real estate (Yang *et al.*, 2007).

In the international shipping market, freight indices have long been used to indicate the fluctuation of freight rate levels and prosperity. Among them, the Baltic Freight Index (BFI) is the most widely used market indicator in dry bulk shipping (Stopford, 1997). BFI, a statistical index covering freight rates on 11 different trade routes (4 for grain, 3 for coal, 1 for iron ore, and 3 for trip charter), is calculated each day as the weighted average of actual rates on the routes. In the Chinese shipping market, the China Containerized Freight Index (CCFI), which is calculated each week as the weighted average of actual rates on 11 routes (Japan route, Europe route, Western Coast of America route, Eastern Coast of America route, Hong Kong route, Korea route, Southeast Asia route, Mediterranean route, South Africa and South America route, and East and West Africa route), is periodically published by the Shanghai Shipping Exchange to reflect the trend of the Chinese container shipping market. Even for Chinese rail transport, which still bears the imprint of a planned economy, a monitoring and early warning system has been designed to describe developments in the rail transport market

(Zhang *et al.*, 2001). With the increasing enhancement of customers' logistics service consciousness, not only is the extent of transport logistics service expanding, but service quality requirements also increasing significantly. In this context, China's transport logistics market remains in its initial stages compared to traditional freight transport. It is of great importance for such an immature market to establish an effective market information guiding system to put it on the right track in this beginning period.

Due to the need to achieve an effective information guiding mechanism between the market and the principal of macro regulation and control (government), it is necessary to structure an IMG model for the Chinese transport logistics market. In this context, this chapter seeks to examine an IMG framework presented in four sections. The first section covers the review of the literature and the theoretical foundation for the establishment of IMG. The second section contains an analysis of the organizational model and running patterns of a transport logistics market prosperity monitoring and early warning system. The building of an information collection system is also discussed in this section. The subsequent section explores prosperity index models of IMG and their applications. Finally, the chapter gives some concluding comments and recommendations.

7.2 Literature review and theoretical foundation for the establishment of IMG for the transport logistics market

The term *early warning* has long been used exclusively by the military (Zhang *et al.*, 2001) and generally not well understood by people in economic activities. It has, in fact, only relatively recently been recognized as an economic analysis tool in its own right.

Early warning research in the economic field—namely, in the United States after World War II—focused both on the macroeconomic level and the microeconomics (enterprise) one (She, *et al.*, 2003). On the former level, a multi-index synthesizing method—Diffusion Index (DI)—has been used, to establish the macroeconomics early warning system, in the US in the 1930s. The model, still in use today, divides the economic index into three categories—precedence, coincidence, and stagnant—to indicate the state of the macroeconomy. In the 1960s, another fundamental method—Composite Index (CI)—was adopted to structure the economic early warning system. Since the late 1970s, the early warning system itself has been fully developed, but the basic theory and information identification is still being developed, especially the internationalization of the early warning system. For instance, the US-based "National Economics Research Institute" and the "International Economics Cycle Research Center" established the "International Economics Indicators System" to monitor the alterations of prosperity of major western industrialized countries (She, *et al.*, 2003).

On the microeconomics level, early warning systems have concentrated primarily on strategic risk management, value at risk-based risk management, and individual differences in risk taking. Both univariate and multivariate approaches to the construction of an early warning

system have been used. The univariate approach was initiated by Fitzpatrick (She & Xi, 2003), while the Multiple Discriminant Analysis (MDA) methodology was first employed by Altman for the prediction of corporate bankruptcy (Altman, 1968). In addition, Laitinen and Chong examine the early warning system for medium-sized and small enterprises after reviewing the factors based on the survey in Finland's companies and UK's banks (Wu & Zhong, 1992). With the establishment of the concept of information flow, Aziz *et al*. employed cash flow-based models to predict the financial predicament of enterprises in 1988 (She & Xi, 2003).

The study of an early warning system in China only started in the 1980s. Its theoretical and practical study experienced a changing process from the spot, macroeconomics, and qualitative analysis to the state, enterprise (microeconomics), and combined qualitative and quantitative analysis. Among the studies, macroeconomics (and banking) early warning is currently a hot topic, and the theory and methodology of the macroeconomics level are comparatively systematic and normative. In the aspects of the practice of early warning systems, the typical case involves the (related) departments of the National Development and Reform Commission (NDRC) and National Statistical Bureau, using economic composite indices and the signal system to analyze the state and fluctuating trend of national economic prosperity. As regards technical aspects, He *et al.* (2000) propose fuzzy neutral network-based macroeconomics early warning models.

Theoretically, an early warning system has four logic phases: identifying the content, searching for the source, analyzing the portent, and forecasting the extent of the situation. In the first phase, the early warning system identifies and recognizes the objective of the early warning. In the second phase, the system attempts to search and discover the factors that cause the situation. In the third phase, the system examines the signals brought by abnormal changes; in the final phase, the system forecasts the extent and changing trend of the situation.

From the perspective of the current theoretical and practical study, the early warning system primarily focuses on the monitoring and evaluation of objectives as well as the establishment and evaluation of the system's index. To this end, the interest in the monitoring and early warning system for Chinese transport logistics market lies in how to normalize the market by adopting the early warning index model on the basis of information acquired from the market and how to provide immediate actions and remedies once risks arise.

7.3 The organization and running mechanism of IMG for Chinese transport logistics market

7.3.1 The organizational model of IMG

One of the key aspects of establishing an IMG for the Chinese transport logistics market is to restructure the organizational system of market management. By considering the division of responsibilities and operational efficiency, the function of the organizational system of transport logistics market management can be divided into three levels—namely, strategic

management, implementation management, and early warning management.

The first level, strategic management, includes the functions of preparing, planning, and making decisions. It involves the works of the Highway Department, the Finance Department, the Planning Department, and the Waterway Transportation Department of MOC1 and the related departments of the National Development and Reform Commission (NDRC), which all fall under the State Council of the People's Republic of China.

The second level is implementation management, which refers to the function of executing the management goals. It involves giving orders to implement managerial rules/processes and operational support to the transport logistics market. The work is mainly undertaken by provincial (or municipal) transportation departments (bureaus), local transport administrative offices, or information centres.

The third level is the early warning management, which focuses on the function of monitoring and controlling the strategic management and implementation management. This function refers to the regular and comprehensive monitoring and controlling of the internal operational processes and the external operational environment of transport logistics. It includes safety monitoring and controlling, efficiency monitoring and controlling, benefit monitoring and controlling, environment monitoring and controlling, and logistics (production) factors in operation monitoring and controlling.

In the organizational system of transport logistics market management, the three different levels of functions are continuously interacting in cycles, as shown in Figure 7-1. This means that the level and importance of each function will change in light of circumstances. An interactive structure indicates that overlapping and complementary functions exist among the three levels. For instance, the main function of MOC1's Waterway Transportation Department is strategic management of the waterway transport industry. In addition, it also has an auxiliary function of early warning management in the organizational system. Under some circumstances, such as when an emergency situation arises, the auxiliary function transforms into the strategic management function.

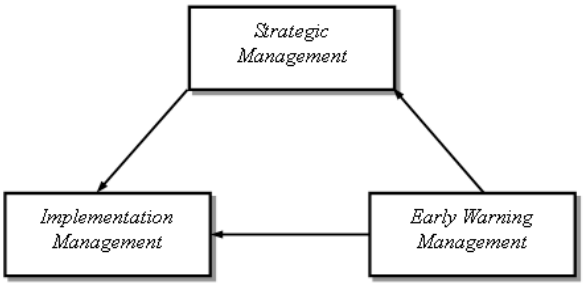

Figure 7-1: The changing process of organizational functions of Chinese transport logistics market management

Source: Author

In the current functional structure of the Chinese transportation management regime, the organizational functions of strategic management and implementation management are already set up, while the early warning management function has not yet been clearly defined. Adding an early warning function to the transportation structure, helps the logistics management system become more practical and comprehensive. It also makes the strategic management function and the implementation function more complete and optimal.

7.3.2 The design of the IMG's information collection system for the transport logistics market

Access to national, sub-regional, and regional sources of data is a very important factor in ensuring the effective operation of *prosperity monitoring* and early warning system for the transport logistics market. Data represent the most critical component in a monitoring system, and the ability to accurately collect, transfer, and analyze data must be clearly supported.

Gathering comprehensive and accurate information for IMG requires developing a transport logistics market information collection system. By drawing on the experiences of the Inland Waterway Observatory system of the EC, such an information system can be designed to a hierarchical administration structure, as shown in Figure 7-2. The information collection system has dual functions; one is data collection, and the other is data output. For the latter function, the system can publicize useful information and provide guidance to logistics operators by setting up a variety of media channels, such as the Internet.

As regards data flow in the system, as shown in Figure 7-2, some information and data collection offices need to be set up in the local transportation departments (or bureaus) of provinces, municipalities, and autonomous regions to take the responsibility for the analysis of data, forecasts and recommendations. These offices are responsible for collecting, sorting out, and transferring local transport logistics information and data, including submitting the information provided by the local designated transport logistics operators, such as shipping companies, trucking companies, freight forwarders etc, to the central early warning department.

The transport logistics operator groups in the system represent local transport logistics enterprises in different cities, provinces, and autonomous regions. These designated enterprises will be chosen by the local information and data collection offices and will be responsible for collecting information for a certain period from different companies and for submitting these data to the local information and data collection offices.

The central early warning department, which falls under the MOC1, will carefully sum up and sort out all the information from the collection offices. Based on this, the central early warning department will decide whether or not to take relevant measures, such as issuing new standards and rules for licenses to specific logistics businesses, to adjust market structure and give orders on implementing rules accordingly to local early warning departments. A report on the Chinese transport logistics market will be produced periodically; the report will be

submitted to the Ministry of Communications and be publicized to the public and the logistic enterprises via news media and websites.

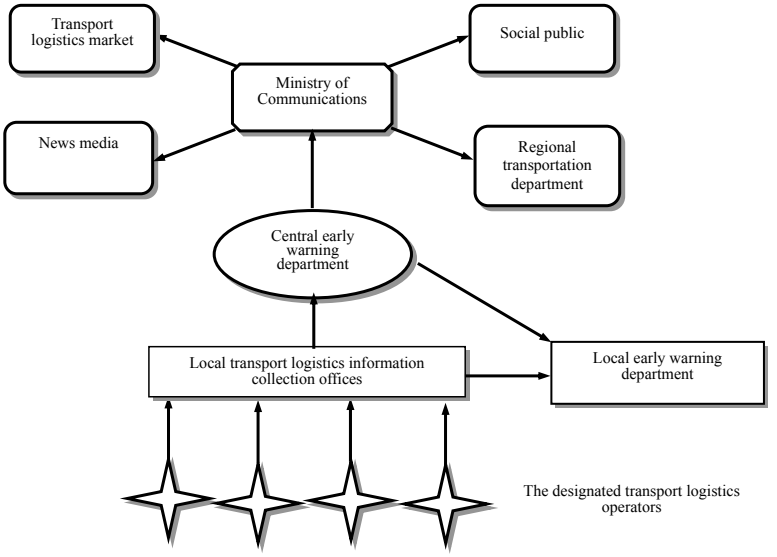

Figure 7-2: The data flow chart of the information collection system for Chinese transport logistics market

Source: Author

7.3.3 The running mechanism of IMG for the Chinese transport logistics market

The IMG should focus on each part of the transport logistics market; hence, it will be composed of several sub-systems that may include a freight (air, waterway, road, and railway); urban logistics; macro transport environment; port and harbour logistics; and warehousing market early warning systems, as shown in Figure 7-3.

For the sub-systems, the management activities are both parallel to each other and mutually exclusive. This means that each sub-system has its own monitoring and early warning objectives, diagnosing benchmarks, and signalling approaches and indices. Meanwhile, the running process will be unified, and the monitoring of information should be exchanged and shared mutually among the sub-systems.

In this regard, operating the IMG will be primarily concerned with the harmonization and cooperation of the sub-systems. Figure 7-4 details the IMG operations for the Chinese transport logistics market (She, 1999). First, the IMG sums up all monitoring information and data about transport logistics activities. Then, it processes the data by identification, diagnosis, and evaluation, which may consist of the level of freight rate/charging, efficiency (utilization) of transport, freight transport safety, etc. Normally, the output should consist of a variety of indices indicating the state of fluctuation and any changing trends in the market. Based on the output of the system, IMG could take different actions to cope with various market situations,

including preparative schemes (pre-control policy) to handle possible emergencies. For instance, as shown in Figure 7-4, when the index outputs are in a normal state, the early warning departments continue the regular monitoring without entering the pre-control state. However, when the outputs are in only a somewhat normal or even abnormal state, the early warning departments offer special monitoring approaches, for instance when an unhealthy price/freight rate cut could trigger a price war, strict supervision and price regulation could come into play so as to maintain fair, equitable, efficient and orderly freight market competition. The relevant pre-control policies are provided to persons in charge so that they can be applied until the indices are restored to normal. Meanwhile the policies are put into the database for future reference.

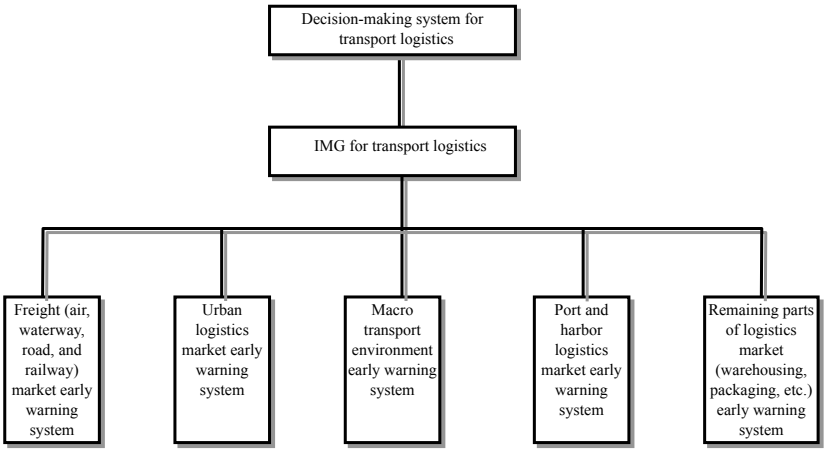

Figure 7-3: The structure of IMG for transport logistics market

Source: Author

When monitoring indices are in an extremely abnormal state, for instance when accidents or the rate of cargo damage or loss reach unacceptable levels, the entire transport logistics management organization enters into an emergency management state. An emergency management group is formed, and emergency countermeasures are brought forward by the early warning departments in central, provincial and/or local transport logistics administration organizations. The implementation of emergency countermeasures is undertaken by designated persons. At times like this, the emergency group substitutes for the regular management and is fully in charge of the management activities of the transport logistics market until the crisis is resolved.

7.4 The IMG model for the Chinese transport logistics market and its application

7.4.1 Approaches to the operation of IMG

The approach adopted in operating the IMG should ensure the sound operation of the

transport logistics market. Such approaches are illustrated in Figure 7-5 (She, 1999). First, the information related to transport logistics enters the IMG system through the data collection channels (network). After storage, processing, identifying, and deducing, the information enters the forecasting and early warning indices system. The forecasting system then forecasts the future internal and external state of transport logistics using qualitative and quantitative forecasting methods. After computing the monitoring indices, the early warning indices system estimates the future state of the transport logistics market. By comparing the output with the early warning benchmark, the system determines whether to send out the warning and what kind of signal should be sounded. The countermeasures in the database of knowledge of transport logistics experts are then allocated and implemented according to the signalling, which will be discussed in section 7.4.4 in detail.

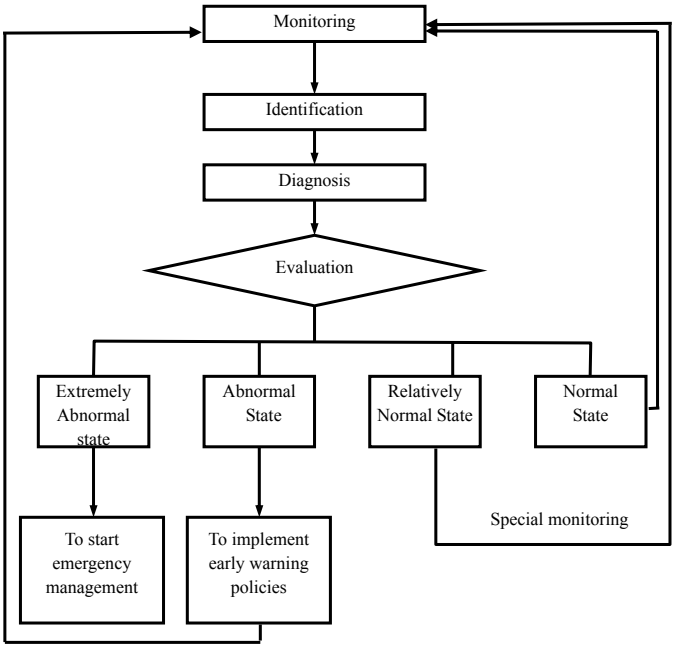

Figure 7-4: The running mechanism of IMG for the transport logistics market
Source: Author

Monitoring, identifying, diagnosing, and evaluating, the IMG not only provides main indications, contributing causes, and trend forecasts of the serious abnormal phenomena for the pre-control policy system, but it also evaluates the "safety degree" of the operations of the transport logistics market. The approach to the latter is to establish a signal graph of output for the early warning information system. The function of the signal graph is primarily to show the general situation of the market comprehensively composed of all abnormal (primary or auxiliary, realistic or potential) phenomena.

The signal graphs (values) are calculated by combining a set of early warning indices, which should reflect the situation in each sector, from the index system of the transport logistics market. The threshold for each index under the various states needs to be set too. After calculating the weighted average for all different signal values, a comprehensive signal graph is drawn up. It is worth mentioning that the choice, boundary drafting, and weights and scoring of each index are adjusted and revised repeatedly while designing the signal graph.

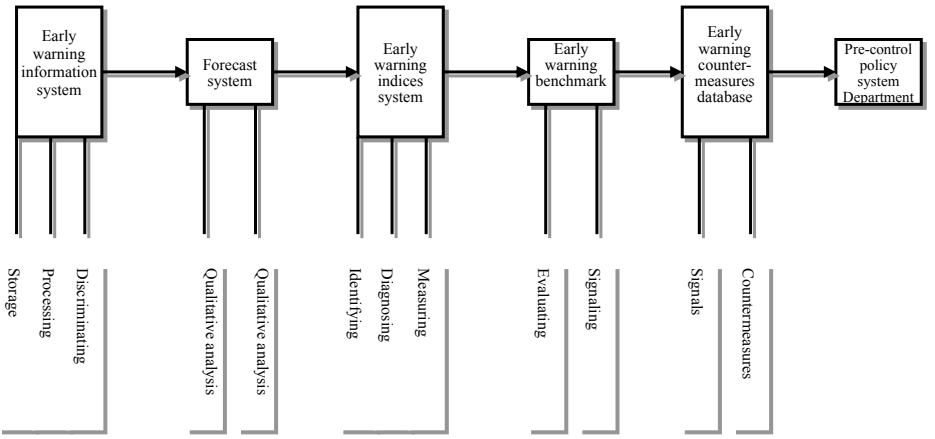

Figure 7-5: The approaches to composition and process of the running of IMG

Source: Author

Generally speaking, the operational situation of each sector of the transport logistics market is reflected by its own signal graph or values, while the general tendency of the whole market is reflected in the composite signal graph. Through the information transferring approach in the transport logistics system, all abnormal phenomena in the various sectors—and the whole market—are demonstrated. As such, the shock from various influential factors may be removed or avoided while still in the embryonic stage, thereby maximizing IMG effectiveness.

7.4.2 Choice and definition of indices for IMG

To a large extent, the rationality and reliability of the IMG depends on the proper choice and definition of index variables or the indices system. The indices system should reflect the characteristics of the transport logistics market from different angles, such as market size, operating quality, and level. In this context, the choice and definition of the indices system for IMG as related to the Chinese transport logistics market will be based on the following principles:

- *Importance*: of great value or concern to the logistics market;
- *Sensitivity*: quick response to fluctuations or market events;
- *Feasibility*: practicality of collecting statistical data under the current statistics regime;
- *Timeliness*: effectiveness in a given period of time;

- *Comprehensiveness*: including nearly every aspect of the logistics market.

In accordance with these principles, the IMG indices system will be structured by four sets of indices, as follows:

- *Volume of transport logistics*, which includes freight volume by all transport modes in terms of tonnes or tonne-kms, total volume of import and export trade, etc.
- *Turnover*, which includes gross domestic product of transport logistics (mainly including transport, warehousing, and post and telecommunications) and total investment in transport logistics infrastructure (mainly including transport and post and telecommunications).
- *Safety and quality of transport logistics service*, which includes quantity or frequency of freight accidents, cargo damage or loss, etc.
- *Performance of logistics enterprises*, which includes the utilization of warehouses, utilization of dedicated railways, light loading rate for return haulage of truck/ship, timely transport, etc.

As mentioned earlier, logistics in China is still in initial stages. Hence, a deficiency in statistical data on logistics exists. For this reason, the system is structured mainly on the principle of "feasibility". Therefore, imperfections are evident in the indices system. For instance, some indices important for indicating the prosperity of the logistics market—such as the total revenue of logistics and price index of logistics services—are excluded from the system due to the lack of statistical data.

7.4.3 The model of prosperity index for IMG

A model of prosperity diffusion index of transport logistics market

In an IMG for the Chinese transport logistics market, the prosperity diffusion index (PDI) model will be adopted to reflect the macro diffusion process of the market operation direction and degree of fluctuation (Zhang, Hu, & Zhang *et al.*, 1999). PDI, also called the prosperity tendency indices (PTI), is composed of a series of vital statistics indices of the transport logistics market. It refers to the number of increasing (diffusion) indices as a percentage of the total number of indices within a certain period.

Derived from the model put forward by Zhang *et al* (2001), let PDI(t) represent the prosperity diffusion index of year t as:

$$\mathrm{PDI}(t) = \frac{\sum_{i=1}^{n} f\left[x_{i,t}, x_{i,(t-j)}\right] \times w_i}{\sum_{i=1}^{n} w_i} \times 100\% \qquad (1)$$

Where,

X_{ij} represents the fluctuating value of index i measured in year t;

i = 1, 2,……,n, n represents the total number of monitored indices;

t = 1, 2……,k, k represents the total number of years within a certain statistical period;

j represents the comparing base period; when j = 1, it means comparing the value of index i in year t to that of last year; and

w_i represents the weight of index i.

$f\left[x_{i,t}, x_{i,(t-j)}\right]$ is a characteristic function, with

$$f\left[x_{i,t}, x_{i,(t-j)}\right] = \begin{cases} 1 & \forall\ (x_{i,t} - x_{i,t-j})/x_{i,t-j} \geq \delta_{i,1} \\ 1/2 & \forall\ \delta_{i,2} \leq (x_{i,t} - x_{i,t-j})/x_{i,t-j} < \delta_{i,1} \\ \cdots & \cdots \\ 1/s & \forall\ \delta_{i,s} \leq (x_{i,t} - x_{i,t-j}) < \delta_{i,s-1} \\ 0 & \forall\ (x_{i,t} - x_{i,t-j}) \leq 0 \end{cases} \quad (2)$$

Where $\delta_{i,s}$ is the separation in which the numerical value of the characteristic function of index i equates to 1/s, ($\delta_{i,s} > 0$, s= 1, 2, …, m).

The aim of setting parameter $\delta_{i,s}$ is to ensure the accuracy of numerical value selection of the characteristic function and make the PDI clearly indicate the trends of the transport logistics market. Some indices are always in a state of increase (or decrease for negative indices, such as the death rate) compared to similar times in the previous year. Thus, when some indices increase (or decrease for negative indices) by a significant margin (e.g., 5 percent), the characteristic function $f\left[x_{i,t}, x_{i,(t-j)}\right]$ is 1. When the increasing (or decreasing) scope is less than 5 percent but greater than 0 (e.g., 2 percent), the value of the characteristic function $f\left[x_{i,t}, x_{i,(t-j)}\right]$ is 0.5. In other words, the characteristic functions for the increasing (or decreasing) indices are determined according to the degree of increase (or decrease) and do not always equal 1. Meanwhile, the value of parameter $\delta_{i,s}$ is basically determined in light of historical trends of all indices. In this research, the value of parameter $\delta_{i,s}$ is determined in light of the statistical data of Chinese logistics market announced by CASW during 2000 – 2005.

The weight w_i can be selected in light of the importance of the index in the transport logistics market based on the Delphi Method, which uses repetitive surveying of experts in transport logistics circles by means of a series of questionnaires and communications. It can be adjusted and revised according to practical results. In this thesis, the weights of the basic indices in PDI of Chinese transport logistics market are chosen by the author based on the advice of transport logistics experts and professors in government agencies, which include the Department of Water Transport Administration of MOC1, the Department of Transport Administration of Guangdong Province and Hubei Province, etc), logistics companies (such as COSCO Logistics (Shanghai/Guangzhou), China Shipping (Shanghai/Shenzhen), Sinotrans (Beijing) ST-Anda Logistics(Shenzhen), etc), and universities/research institutions (including Scientific Academy of Waterborne of MOC1, Beijing Jiaotong University, and Wuhan University of Technology, etc. To emphasize the importance on the transport logistics market

of freight volumes in terms of tonnes and tonne-km, the weights of the two indices are set to 2.0, respectively. In the indices system, GDPs for transport logistics is one of the most important indices, so its weight is set at 2.5. For the remaining indices, the weights are either 1.0 or 0.5. For indices of performance of transport logistics companies, the weights are all set to 0.2 due to their lesser importance in influencing the logistics market. The sum of all weights is 10, as shown in Table 7-1.

Because the nationwide statistical survey of the logistics market only began in 1999, and the host of the survey is CASW, a non-governmental institute, instead of the governmental department, official statistical data are fairly lacking. For this reason, this chapter selects performance indices including "Amount of freight accident", "Utilization of warehouses", "Utilization of dedicated railways", "Light loading rate of return haulage of truck", "Rate of timely transport", "Rate of cargo damaged or lost", etc., according to CASW's annual survey reports for 1999, 2001, and 2003 (CASW, 2000, 2002, 2004). It is worth noting that "Amount of freight accident", "Light loading rate for the return haulage of truck", and "Rate of cargo damaged or lost" are negative or reverse indices—or indices for which the smaller the annual rate of increase, the better state the index indicates. Thus, the numerical values of these indices are selected based on the rate of decrease.

Table 7-1: The weights selected for the basic indices of prosperity diffusion indices of Chinese transport logistics market

The basic prosperity early warning indices	$\delta_{i,1}$	$\delta_{i,2}$	Weights(w_i)
Freight volume by all transport modes in terms of tonnes	$\delta_{1,1}$ =0.03	$\delta_{1,2}$ =0.005	W_1=2.0
Freight volume by all transport modes in terms of tonne-km	$\delta_{2,1}$ =0.05	$\delta_{2,2}$ =0.01	W_2=2.0
Total volume of import and export trade	$\delta_{3,1}$ =0.10	$\delta_{3,2}$ =0.03	W_3=1.0
Total investment for transport logistics infrastructure	$\delta_{4,1}$ =0.30	$\delta_{4,2}$ =0.15	W_4=1.0
Gross domestic product of transport logistics	$\delta_{5,1}$ =0.05	$\delta_{5,2}$ =0.01	W_5=2.5
* Amount of freight accident	$\delta_{6,1}$ =0.05	$\delta_{6,2}$ =0.01	W_6=0.5
Utilization of warehouses	$\delta_{7,1}$ =0.07	$\delta_{7,2}$ =0.02	W_7=0.2
Utilization of dedicated railway	$\delta_{8,1}$ =0.05	$\delta_{8,2}$ =0.01	W_8=0.2
* Light loading rate for return haulage of truck/ship	$\delta_{9,1}$ =0.03	$\delta_{9,2}$ =0.005	W_9=0.2
Rate of timely transport	$\delta_{10,1}$ =0.08	$\delta_{10,2}$ =0.003	W_{10}=0.2
* Rate of cargo damaged or lost	$\delta_{11,1}$ =0.01	$\delta_{11,2}$ =0.005	W_{11}=0.2

Note: *These are negative indices, so they represent the decreasing percentage of the indices comparing to those of the previous year.

Source: Author

Analysis of PDI model and applications for transport logistics market

Drawing the PDIs in a given period results in a polygonal line with a function value ranging from 0 to 100 percent. Usually, 50 percent is referred to as the separation line (or prosperity turning line); it demonstrates that, during a depressed period, the prosperity of transport logistics market starts to recover when the PDI rises to 50 percent while, during a boom period, the prosperity of transport logistics market starts to decline when the PDI falls to 50 percent. Based on the prosperity index model of transport logistics market mentioned earlier and using indices from 1991 to 2001, we can determine the prosperity situation and trend for the decade (China Statistic Bureau, 1996-2002; Ministry of Communication of China, 1996-2002). By calculating and analyzing these statistics, the PDI of the logistics market can be determined; the results are shown in Figure 7-6.

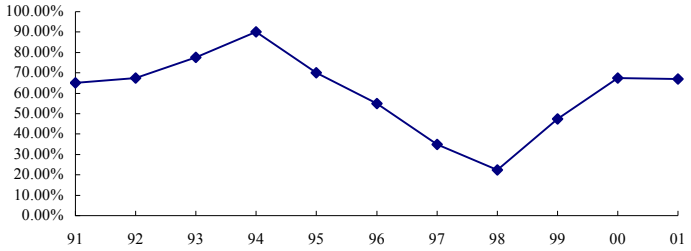

Figure 7-6: The curve of prosperity diffusion indices for Chinese transport logistics market
Source: Author

Figure 7-6 shows that, after the prosperity indices peaked (90 percent) in 1994, they began to fall. From 1997 to 1998, the logistics market was in a depression. In 1998, the PDI fell to its lowest point (25 percent), but starting in 1999, the market began to revive and entered a state of increase.

7.4.4 Prosperity signal model of IMG for Chinese transport logistics market

The prosperity signal (PS) model is usually used to indicate the dynamic state of the market by setting a few sub-indices according to the range-ability based on the evaluation indices (Xing, Zhang, & Hu, *et al.*, 2000). The fundamentals of prosperity signal model use the sum of the evaluation indices (prosperity scores) in a certain period to demonstrate the "prosperous degree" of market for the period. The qualitative section (interval), where the comprehensive prosperity scores remain, indicates the qualitative evaluation and macro-trend of comprehensive market prosperity.

Procedures of the prosperity signal model

The first step involves setting the state sections (interval) and the critical points of the warning index signals. The state of the entire logistics market is divided into five positioning sections: "bad", "dissatisfactory", "normal", "satisfactory", and "excellent". Four critical points and five identification sections are set according to the different operational states to

serve as the reference system (Liu, 2003). Assuming S_1, S_2, S_3, and S_4 are critical points, if it is beyond S_1, the prosperity situation is very bad. If it is between S_1 and S_2, the situation is not too bad, but not satisfactory; if it is between S_2 and S_3, the situation is normal, and if it is between S_3 and S_4, the situation is satisfactory. The situation becomes excellent when it is above S_4. The critical points are set according to historical experience. Critical points of the prosperity warning indices are shown below in Table 7-2.

The second step involves setting signals and scores for the early warning indices using the prosperity signal method:

✧ Mark the five divided sections—"bad", "dissatisfactory", "normal", "satisfactory", and "excellent"—with different signals and scores (e.g., ☆ for 1, ★for 2, ✱for 3, ✱for 4, and ✹for 5).

✧ Set four critical points according to the historical data of the warning evaluation indices.

✧ Compare the actual numerical value (rate of change) of the indices with the critical points they locate and determine the scores by checking the index signals.

Table 7-2: The separation point for the prosperity early warning indices

Prosperity early warning indices	S_1	S_2	S_3	S_4	Weights (w_i)
Freight volume by all transport modes in terms of tonnes	0.00	2.00	3.00	5.00	W_1=2.0
Freight volume by all transport modes in terms of tonne-km	0.00	2.50	5.00	8.00	W_2=2.5
Total volume of import and export trade	1.00	3.00	6.00	10.00	W_3=1.0
Total investment for transport logistics infrastructure	1.00	4.00	6.00	10.00	W_4=1.0
Gross domestic product of transport logistics	5.00	8.00	15.00	20.00	W_5=2.0
Amount of freight accident	5.00	10.00	15.00	20.00	W_6=0.5
* Utilization of warehouses (%)	75.00	80.00	85.00	90.00	W_7=0.2
* Utilization of dedicated railway (%)	60.00	68.00	75.00	80.00	W_8=0.2
* Light loading rate for return haulage of truck/ship (%)	35.00	30.00	20.00	15.00	W_9=0.2
* Rate of timely transport (%)	78.00	80.00	88.00	95.00	W_{10}=0.2
* Rate of cargo damaged or lost (%)	3.00	2.50	1.50	1.00	W_{11}=0.2

Note: *The absolute values are used for these indices; others are increasing percentages of the indices compared to the same time last year.

Source: Author

The third step is to determine the comprehensive prosperity situation:

- Sum up the sub-indices and the weights and average the total by calculating the total prosperity scores for each year and then determining the situation by checking the comprehensive signals. Generally, 80 percent of the total score is regarded as the

first dividing line, 70 percent is the second, 50 percent is the third, and 40 percent is the fourth.

- Determine the logistic market prosperity situation according to the prosperity signals and produce the monitoring report. When the signal of two continuous years or more remains the same, it is believed that the comprehensive prosperity has transformed its state.

Research on the application of the PS model

According to statistics from the transportation yearbook and data from the report of the third national logistics market supply and demand investigation conducted by CASW, using 1998, 1999, and 2001 as examples (CASW, 2000, 2002, 2004), the PS situation of the logistics market warning indices can be seen in Table 7-3. From these data, it is clear that, in 2001, judging by the logistics indices, the whole nation's volume of goods transported, rotation volume of goods, and customs import and export volume of trade fell within the "satisfactory" parameters. In view of the economic indices, the amount of capital invested in logistics infrastructure remained in the "excellent" section, while the GDP in logistics remained "not satisfactory". The safety indices all reflected "bad" results due to the rapidly increased rate of transportation accidents. As for the operational efficiency of logistics enterprises, the indices stayed in the average to bad range.

Table 7-3: The prosperity signal of early warning indices for Chinese transport logistics market in 1998, 1999, and 2001

Prosperity early warning indices	1998		1999		2001	
Freight volume by all transport modes in terms of tonnes	☆	1	★	2	❋	4
Freight volume by all transport modes in terms of tonne-km	☆	1	❋	4	❋	4
Total volume of import and export trade	☆	1	✹	5	❋	4
Total investment for transport logistics infrastructure	✻	3	☆	1	✹	5
Gross domestic product of transport logistics	✻	3	✻	3	★	2
Amount of freight accident	✻	3	★	2	☆	1
* Utilization of warehouses（%）	☆	1	☆	1	★	2
* Utilization of dedicated railway（%）	☆	1	☆	1	☆	1
* Light loading rate for return haulage of truck/ship（%）	★	2	★	2	★	2
* Rate of timely transport（%）	★	2	★	2	✻	3
* Rate of cargo damaged or lost（%）	✻	3	✻	3	✻	3
Comprehensive prosperity signal for transport logistics market	☆		✻		✻	
Comprehensive scores of the prosperity for transport logistics market	1.88		2.83		3.27	

Source: Author

7.5 Conclusions

Based on the theory and practice of early warning system, this chapter has examined the framework for an effective market information guiding system of transport logistics market—namely, an IMG model. It systematically discussed the theoretical foundation for the establishment of IMG and the organizational model and operational patterns of transport logistics market prosperity monitoring and early warning system. It designed an information collection system for the availability of data in IMG. The chapter centred on the design and operation of PDI models and PS model of IMG. In particular, the chapter discussed the applications of PDI and PS models in light of the statistical data on Chinese transport logistics market over the past 10 years.

Of course, the theory and practice of the transport logistics prosperity monitoring and early warning system are not yet fully developed. The establishment of the index system needs further improvement, such as considering the selection of the separation points more carefully and consistently and focusing additional attention on the micro situation.

Chapter 8 Conclusions

8.1 Introduction

Increasingly demand for integrated global logistics has led to the development of a considerable market for logistics services, not only in traditional industrialized countries, but also in emerging prosperous developing economies such as China. Along with China's emergence as a global manufacturing centre, China is reshaping its logistics channel that is getting more global. The new outsourcing trend for manufacturers, to look for global logistics packages in particular rather than just straight transport or forwarding, has opened new windows of opportunity for transport companies and encouraged most of them to transform into intermodal logistics organizations.

The driving role of logistics in the development of the Chinese national economy has become obviously enhanced over the past decade. As such, the dependence of the Chinese economy, which is developing at top speed, on logistics is also increasing steadily. This momentum means great opportunity for the growth of the Chinese transport industry. However, there currently exist some impeding factors in the Chinese logistical environment, which include:

- The mechanism by which the government regulates and controls the logistics market, while the market guides the operational behaviours of logistics enterprises, has not yet been established.
- The structure of the logistics infrastructure platform is currently by and large in an abnormal state.
- The various functions of logistics are divided into different administrative departments.
- Regulations seem to be formed in the shade of segmented departments and regions.

The impediments to the growth of Chinese transport logistics will enlarge the difficulty of logistical operation and integration in the transport industry if the corresponding measures are taken improperly.

Actually, both the Chinese transport logistics firms and administrative organizations have taken actions towards an integrated logistics system. Within the changing context of satisfaction wrt shippers' requirements, the major Chinese groups operating in freight transport and shipping services have shifted their attention from a port-to-port approach to that of door-to-door and even "shelf-to-shelf" one, so as to provide services that better meet the needs of customers. In addition to transport services, they have also implemented strategic choices to engage in warehousing, distribution, and other outsourcing activities that aim to achieve control of the whole supply chain. In this continuously evolving scenario, the approach of Chinese transport companies towards logistics should be analyzed properly,

taking into account that, with China's entrance to the World Trade Organization (WTO), the most significant foreign logistics and transport/shipping companies are and/or have been infiltrating into the Chinese logistics market by setting up joint ventures or acquisitions to achieve competitive positions in Chinese logistics and transport services. To gain competitive advantage in such a dynamic market environment, the Chinese transport industry is restructuring its services through incorporating logistics thinking and concepts into transportation services and management operations. In the mean time, the booming demand for transport logistics services has also led government agencies to systematically examine the situation, barriers, and counter-strategies of Chinese logistics development. However, this will require co-ordinated governmental interventions, including harmonized regulations, and the standardization of frameworks wrt the use of technologies and infrastructures. In other words, the appropriate government intervention will play a significant role in the healthy development of logistics, especially for the emerging logistics market of China.

Consequently, restructuring the architecture of China's traditional transport industry by incorporating logistics thinking and embodying the strategic objective of Chinese logistics development is becoming a competitive imperative. The aim of architecture restructuring is to establish and improve the mechanism of integrated logistics operations and planning, as well as the construction of transport logistics infrastructure and facilities. By using the experience of developed economies as a reference and by integrating its own actual conditions, China must strengthen the co-ordination and harmonization of each component and node of its logistics system. This should be helpful for speeding up the establishment of an efficient logistics network in order to satisfy the increasing demand for value-added logistics services.

Compared to the traditional transport architecture, the architecture of transport logistics (ATL) is an integrated and coordinated system that combines the principles (logistics enterprise, government agency), circumstances, and operational mechanism. The main function of the system is to accelerate the essential interaction and coordination among transport logistics enterprises, government agencies, and relevant institutions at the national level. Accordingly, constructing the system will benefit the advancement of a reasonable allocation and utilization of transport logistics resources. To this end, exploring a framework for the establishment of ATL with appropriate structure, complete functions, and efficient operations, focusing on the macro environment and supporting system as well as cultivating the mechanism and monitoring model and the technique strategy of Chinese transport logistics is the main mission assumed in the above research.

This chapter summarizes the findings and conclusions of this research and discusses the implications for theory, management, and policy makers of Chinese transport logistics. Limitations, together with suggestions for further study, are given in the final section of this chapter.

8.2 Summary of findings and conclusions

Fundamental structure and components of the architecture of Chinese transport logistics (ACTL)

Current trends in logistics strategies of transport companies are featuring alliances, TPL, value-added logistics services, dedicated terminals, and the involvement in inland transportation. Following worldwide trends, transportation is currently evolving into the stage of logistics after experiencing two periods of unimodal transport and multimodal transport, respectively. In light of the inherent linkages and characteristics of transport and logistics, an ATL should be established by means of merging the features of logistics into AT. In general, the restructuring of the transport logistics system should merge the characteristics of transport as well as reflect the requirement of logistics. The following features highlight the inherent linkages and characteristics of transportation and logistics:

- Logistics is a revolutionary breakthrough in traditional transportation
- Transportation is a core sector and function of logistics
- Transportation cost occupies the most important place in logistics costs
- The greatest possibility is for transport firms to be principal players in the logistics market
- Logistics is an inexorable trend of transport industry development
- Transportation has different features from logistics

Accordingly, the framework for the architecture of Chinese transport logistics (ACTL) should include the components of ATL, as well as the gradational and structural relationships among these components and the rules and policies that improve and supplement them, for the purpose of regulating the operations of Chinese transport logistics. In the ACTL, the construction of two fundamental platforms—infrastructure and information—as the hardware is of great importance for the development of transport Chinese transport logistics. Furthermore, the rules and policies, serving as the software of ATL—which include administration and supervision of the transport logistics market, admission to or withdrawal from the market, coordination mechanism among various operating and managing initiatives for transport logistics, and standardization and normalization of transport logistics—are obviously playing very important roles in an emerging logistics market like China.

In this context, ATL has three gradations. The basic gradation is the market system, composed of supply of and demand for transport logistics services. The second gradation is the platform (hardware) system, which includes the transport logistics infrastructure and information systems. The third gradation is the environment (software), covering the administration regime, policy and regulatory system, and cultivation of transport logistics enterprises.

To restructure ATL in China, foreign (western) country experiences in transport logistics administration and regulatory regimes, and the intrinsic requirements of transportation development are defined as the foundations.

State-of-the-art in Chinese transport logistics market structures

The demand for transport logistics services is characterized by four aspects. First, compared with developed countries, Chinese enterprises are reluctant to outsource their logistics activities; no signs indicate a spectacular increase in the willingness to operate their logistics services externally. The lack of awareness of the concept and importance of logistics is the main factor hindering the willingness to outsource. Other factors include traditional thinking of "self-reliance" and inefficient enterprise management on shippers' side; low-level service quality and high operational costs on TLPs' side; unfavourable logistics circumstances, such as segregated administration regimes for logistics industry; and comparatively low degree of commercialization, diversification, and specialization. The second feature of China's transport logistics demand is the nature of logistics functions outsourced, which is transformed from a quantity-oriented service to a quality-oriented one, together with aspects of diversity and individuality. The third feature creates a state of non-equilibrium between China's eastern coastal area and its central and western areas; coastal regions have grown rapidly, benefitting from logistical accessibility and well-developed infrastructure, while interior areas have fallen behind. The last feature concerns market segmentation.

According to the survey, the perception of Chinese transport companies of the new concept of logistics is increasingly expanding. As such, with the energetic support of the government and extensive publicity, the majority of Chinese transport enterprises have developed a sound knowledge on logistics, and most of them now understand the significance and urgency of providing logistics services that meet customer needs. Regarding pricing policy and competition, operators in the transport logistics market (especially deep-sea and road haulage) were free to set prices based on market developments and competition strategies. Although 70% of respondent companies in this survey stated that they would not adopt a low price policy, numerous Chinese transport logistics companies, medium and small-sized ones in particular, have actually adopted cost-oriented strategies, of low cost and low profit, for market competition because of market immaturity and the narrow range of service areas. Together with deregulation, the entry into the WTO has resulted in the arrival of foreign logistics giants. As these companies possess tremendous advantages of capital, technology, and operational experience, it is very difficult for China's local logistics providers to compete with them if they do not offer innovative services that are of high service quality.

In China's transport logistics market, there exist different kinds of logistics enterprises acting as competitive principals. Therefore, competition between LSPs exists and it can be categorized the following three levels, namely,

- High level competition: companies involved in this level mostly target major core customers and big logistics project/solutions;
- Medium level competition: companies involved in this level mostly focus their multi-functional logistics services on multimodal container transportation and freight forwarding services, and
- Low level competition: companies are mostly dealing with basic and simple logistics operations.

The opening-up of the Chinese transport logistics market provides opportunities for multinational logistics companies. They are taking up a large share in China's logistics market. However, with resource integration, optimization and consolidation, Chinese logistics enterprises will further enhance their competitiveness. In this context, competition tends to be more intensive in China's logistics market. The emerging trends in competition in the Chinese transport logistics market appear as follows:

- Demand for logistics services tends towards high quality and subdivision;
- Competitive environment becoming tough;
- Competition in the highly profitable distribution sector will become fiercer.

The statistical analysis of the survey identified selected indicators with relatively higher standard deviations. This could be due to the fact that the range, level, and capability of service of transport logistics providers differ in various locations and between companies with different managerial ability and efficiency.

Strategy for encouraging a modal shift from less sustainable modes of transport—particularly road transport—to environmentally friendly modes

Along with globalization and the increasing need for competitiveness, the ability of countries to improve logistical quality and reduce transaction costs through the provision of adequate and efficient intermodal transport systems is more critical than ever. In this respect, intermodalism is increasingly at the core of most advanced logistics strategies used by the major transport companies in the world (OECD, 2001). The intermodal concept is therefore an integral part of the global logistics chain concept. In this context, a priority is to integrate the more environmentally-friendly modes of transport – rail, inland waterways and short sea shipping – into the transport chain more effectively (European Parliament, 2007). Consequently, quality intermodal transport logistics is a critical aspect to be taken into account for restructuring the architecture of Chinese transport logistics (ACTL).

For the requirements of a sustainable intermodal shift, among others, European policy makers and researchers are becoming increasingly involved in matters concerning the decoupling economic activity from transport activity in order to reduce congestion and other negative side effects of transport (Gilbert *et al.*, 2002). Considering the rapid growth of road transport and its impact on the environment and land use in China, this research has examined the significance and feasibility of the decoupling initiative. To this end, this research assesses the relationship between freight transport and economic activity in China and has examined possible factors that may affect it. In particular, the research has looked at the appropriate government intervention and policy instruments for building a new era of sustainable intermodal transport logistics in China, which will be an important contribution to the national strategy of "social harmonization".

Based on the figures provided by this research, it appears that the relationship between total freight transport and economic growth in China is not as strong as that in Europe, although no intentional efforts to weaken the link have been made by the Chinese government. This

pattern is further supported by Huenemann (2001). With regard to the possible reasons behind the weak link between transport demand and Chinese economy, the following could be considered: reduction in the weight of cargo, especially raw materials for heavy industry before shipping, such as washing coal, converting logs to sawn lumber, and concentrating and smelting minerals; the coastal concentration of growth; the structural shift of GDP toward sectors that are less transport-intensive; and measurement error in road traffic statistics (Huenemann, 2001).

However, although freight transport intensity in China has seen a steady decline over the past few years, it is still much higher than that of the US and EU. Having said this, the difference would not be so big in terms of purchasing power parity of the Chinese currency (RMB). In this context, the Chinese government has to take purposeful action, including dematerialization of the economy, increasing the cost of road freight transport, revitalizing railways, freight organization and integration techniques, cleaner vehicle technologies and the establishment of local production 'clusters' (Ballingall *et al.*, 2003), etc., to decouple transport from economic activity considering China's rapid economic growth . The measures proposed by the EU can be helpful for China in establishing a sustainable (intermodal) transport system, although among them, reducing demand for transport, especially for road transport, may not be a practical solution considering China's fast economic growth and external trade. Furthermore, attention should also be given to the development of remote areas where transport infrastructure is lacking sufficient capacity to deal with demand and is still in need of modernization. Instead, redistribution between modes should have an immediate impact on modal choice (Meersman *et al.*, 2003). For a more favourable intermodal shift, it appears that important investments need to be made in dedicated cargo railways and inland waterways in China at this stage.

Regarding the revitalization of alternative modes to road freight transport, in addition to inland waterways and coastal shipping, improving the efficiency of rail transport by reforming its administrative regime and liberalization must receive more attention by the Chinese government as railways holds a historically dominant position in China's freight transport. Undoubtedly, it is unlikely that the rail sector will be able to respond to growing market demands in an efficient, innovative, and responsive manner as long as it is managed by the government. Without reform, a real risk exists that transport bottlenecks in rail transport will develop, constraining the growth of the Chinese economy and limiting the extent to which the rapid growth in China's coastal regions will spread to the interior. Any thorough reform of the Chinese rail sector will involve the restructuring of the current rail enterprises (OECD, 2002). The principle of internalization of external costs should be applied to its pricing system in order to rebalance China's modal split. At this stage, the introduction of a fuel tax regime should be considered, as a proper fuel tax in China—as in other countries—could be the instrument of choice for limiting car use, vehicle pollution, and energy intensity.

Modelling policy optimization for sustainable transport logistics

For the purpose of improving the quality of more environmentally friendly modes such as rail and water transport that compete with road haulage, which is true intermodality, appropriate

policy decisions are urgently needed. For the Chinese shipping sector, which is not yet perfectly integrated into the nationwide transport logistics network, a policy on maritime safety, as well as a policy aimed at the reflagging of ships to China's registers could promote the integration of international shipping into "one-stop shop" logistics chains. Shipping is the predominant mode of transport for international trade and, indeed, over 90 percent of China's foreign trade is carried by sea. In this respect, finding an optimal policy alternative is extremely important for maximizing the average performance level of a transport logistics system.

In China, as in most other countries, flagging out has been shown to have serious negative impacts on national shipping development and on the national economy. To change the situation, China has to adjust its shipping policy according to experiences in countries that have faced this unfavourable development earlier. Such policy reorientation should be based on the evaluation of the economic, social, and political effects of shipping registry alternatives. China should adopt more preferential shipping policies, such as favourable shipbuilding arrangements, tax exemptions for ships in international trades, waivers of social charges on seafarers, tonnage-based corporate taxation, and greater support to maritime education and training in order to maintain skills and a flexible labour force. Finally, the establishment of a parallel registry, along the lines of the European experience, as suggested in this paper, would help in attracting Chinese-owned vessels.

Strategic positioning and operational restructuring for Chinese transport logistics service providers

Without qualified transport logistics service providers that are able to provide high-level integrated logistics services, China's transport logistics industry could not be expanded to meet the need for value-added logistics services of both national economy at the macro level and customers/shippers at micro level. Just as the transport logistics industry itself, the Chinese transport logistics enterprise is still in its infancy compared to its international counterpart. The concept of outsourcing logistics services to TPL is not widely acceptable in Chinese manufacture/business cycles. In particular, SOEs have not yet realized the importance of using TPL (CASW, 2002). This situation shows precisely that a great potential exists in the Chinese logistics market. In the changing logistics market, the role and position of the Chinese shipping industry have to be defined in light of their strengths and weaknesses.

To gain competitive advantages in such a dynamic market environment, the Chinese shipping industry has promoted the restructuring of its services and organization. In this context the industry also explores proper logistics development models, serving better customer demands. To this end, an effective cultivating mechanism that will provide a way to foster and nurture leading logistics providers with the best practices should be set up and increasingly perfected, thereby speeding up the transition and promotion of Chinese transport logistics enterprises (Yang, 2007). Foreign transport logistics companies, which have rich experiences in logistics best practices and advanced logistical management skills, should be introduced to the Chinese transport logistics sector through partnerships, alliances, mergers, and acquisitions. For

Chinese shipping and logistics companies, they must overcome their weakness of low productivity and efficiency by improving technical and managerial skills and by taking full advantage of their strengths, like extensive domestic services networks, especially for large shipping firms, plenty of transport and storage facilities, good relationships with central and local government and domestic shippers, and low operating costs. Otherwise, they will not be able to compete with their foreign rivals in the competitive logistics market. Actually, in the past few years, China's large state-owned shipping companies (SOEs), together with medium-sized and small shipping companies ,have taken steps to restructure their logistical operations and play active parts in supplying value-added third-party logistics solutions by leveraging their strengths in facilities, existing presences, human resources, low costs, and service networking.

Establishment of an effective market information guiding system for the Chinese transport logistics market

An effective market information guiding system plays an important role in ensuring that market economies function orderly. Compared to the traditional freight transport market, the (transport) logistics market of China is still in its initial stages. To this end, it is of great importance in such an immature market to establish an effective market information guiding system to put the industry on the right track in its initial development. For the purpose of achieving an effective information guiding mechanism between the market and the principal of macro regulation and control (government), it is necessary to structure an IMG model for the Chinese transport logistics market.

In this context, based on the early warning theory and practice, this research has set up the theoretical foundation for the establishment of IMG and the organizational model and operational patterns of transport logistics market prosperity monitoring. An information collection system for the availability of data in IMG has been designed. In this respect, this research has centred on the design and operation of PDI models and PS model of IMG. In particular, the applications of PDI and PS models in light of the statistical data on Chinese transport logistics market over the past 10 years have been examined.

8.3 Implications of this research

As presented in Chapter 1, the ultimate objective of this research is to set up a framework for the establishment of the architecture of Chinese transport logistics (ACTL) with appropriate structure, complete functions, and efficient operations, focusing on the macro environment and supporting system, as well as on cultivating the mechanism and monitoring model and the strategies of Chinese transport logistics. In this context, the contributions of this research to the logistics management cover two levels. At the macro level, this research has discussed the establishment of a coordination mechanism among various operating and managing initiatives in Chinese transport logistics, aimed to improve the supporting environment of the industry (which includes administrative regimes, rules and policies). In this respect, the findings of this

research, such as the need for a sustainable intermodal shift, maritime policy optimization and information guiding system, provide the theoretical support and policy guidelines for government agencies to effectively exercise the function of macro adjustment and supervision on the transport logistics market. At the micro (firm) level, this research has examined the growth of Chinese transport logistics, the characteristics of supply and demand, and market competitiveness, together with the experiences and best practices of foreign logistics companies. Obviously, the findings in this respect offer advisory recommendations to Chinese transport logistics enterprises, to provide value-added logistics services to satisfy customers based on market mechanisms.

From a theoretical perspective, this research has defined a foundation for systematic research into the architecture of transport logistics (ATL), in accordance with the inherent linkages and characteristics of transportation and logistics. This provides an analytical tool to examine how the components of ATL and the gradational and structural relationships amongst them have influenced the evolution of the transport logistics system.

From a methodological perspective, this research has developed models and approaches of both inductive and deductive ways to improve the reliability of the models. In this connection, early warning theory has been initiatively applied to the establishment of an information monitoring guiding (IMG) model. Combining quantitative computation with qualitative analysis, this research explores the prosperity index models of IMG and their applications in the Chinese transport logistics market. Moreover, a fuzzy evaluation model is employed to model the optimization of maritime policy. The approach to the investigation in this research has combined typical on-the-spot investigations, questionnaires, expert advice, relevant observations, and a literature review, in order to increase multi-sources and channels of information and data.

As to the empirical implications of this research, the practices in transport logistics business and the co-ordination mechanisms among government, institutes, and enterprises in foreign countries (especially Europe) have been discussed. This enables China to use advanced foreign country experiences in transport logistics as points of reference, and incorporate the development characteristics of foreign counterparts to set up its own ACTL. Case studies in this research have focused on the operational models of Chinese transport logistics companies, as well as on the logistics best practices of some famous foreign transport logistics companies. It is hoped that the case studies will enrich understanding for both Chinese and international logistics circles.

8.4 Limitations and suggestions for further study

This research has examined the restructuring and co-ordination mechanisms for the architecture of Chinese transport logistics (ACTL) based on the exploration of gradational and structural relationships between the components of architecture of Chinese transport logistics. The defined ATL in this research conforms with Chinese realities. Consequently, the *status*

quo and problems faced by Chinese transport logistics had to be investigated firstly. These are the fundamental issues that must be addressed in building the architecture of Chinese transport logistics (ACTL). However, the Chinese transport logistics sector is far from maturity. Incomplete data and insufficient information sources in the sector have limited the extent of the investigation, and caution is therefore required when interpreting the results of the research.

The scope of transport logistics needs to extend to include ports, depots, and logistics centres. The industry's geographical coverage also needs to be expanded, beyond our sample that mainly concentrated in coastal areas (questionnaire survey and interviews).

At the same time there are a number of issues that need further attention in future study in this field. Of particular importance in this respect are the infrastructure pricing policies, as an appropriate modal split will only be achieved if infrastructure is priced on a comparable basis. Matters related to the basis for integration and coordination among the various parts in a transport logistics chain, such as performances indicators for transport logistics companies; requirements for qualified professionals; standardization and normalization of the transport logistics system; and the construction of an intermodal transport information system (platform), deserve further analysis and research.

Annex 1: Surveying for the research programme "Study on the Framework for China's Transport Logistics System"

Cover Letter

To whom it may concern,

The research team from the School of Transportation, Wuhan University of Technology is undertaking a research programme "Study on the Framework for China's Transport Logistics System", which is assigned and funded by the Ministry of Communications (MOC1), China. This research aims at promoting the development of Chinese transport logistics in accordance with the establishment of an integrated and coordinated mechanism; meanwhile, this research want to clarify the role of the government in macro management, market supervision, and coordination with various players in transport logistics chain. In this context, the research team needs to know about the current situation of Chinese transport logistics market, and this is the purpose of the following survey.

In this survey, the research team will investigate the characteristics of supply and demand of Chinese transport market. In the mean time, the problems existing in China's transport logistics infrastructure, administration regime, enterprises' operations etc will be explored. In order to establish an effective transport logistics platform, a coordination mechanism and a fair and orderly competitive environment for Chinese transport logistics industry, the research team expects your active participation and answering to the questions in the following questionnaire form. The research team promises to keep the confidentiality for the information of those respondent enterprises, and the research team would like to express his appreciation to the respondent enterprises in proper means after the programme has been finished.

Thanks for cooperation.

Sincerely yours,

The research team for the programme "Study on the Framework for China's Transport Logistics System"
School of Transportation, Wuhan University of Technology
Wuhan, Hubei Province, China
March 2003
Telephone: 027-86551196, Fax: 027-86551193

Questionnaire form for the research programme "Study on the Framework for China's Transport Logistics System"

Please fill in the form based on the situations of your company (please tick the appropriate box to the left of your choice).

I. Basic information about your company

1. Types of transport logistics business of the company (multi-choices)
□cargo delivery □cargo handling □container stuffing
□customs clearance and quarantine inspection □freight forwarding
□ship agent □package □storage □processing in circulation
□others (please note in details)

2. Transport capacity of your companies is:
□surplus □moderate □deficient

3. The approaches to canvassing business orders (cargo) in your company
□visiting customers (shippers) □building a long-term contractual relationship
□via the agent □shippers' dropping in

4. The major types of cargo transported by your company (multi-choices, please specify1.2.3……according to the degree of importance)
□grain □oil and chemicals □spare parts
□telecommunication equipment □textile and clothing □medicine
□coal □foodstuffs □articles of daily use □container
□iron ore and building materials □other (please note in details)

5. The regional distribution of your company's business (multi-choices, please specify1.2.3……according to the degree of importance)
□local □domestic
□cross border (international/Hong Kong, Macao, and Taiwan)

6. The major factors that may affect the profit of your company (multi-choices, please specify1.2.3……according to the degree of importance)
□difficulty in cargo canvassing □cut-throat competition and low price
□rising costs □too much short distance haulage □safety accidents
□transport equipment can not meet the operation requirement □lack of quality human resources □shortage of freight information management system
□other (please note in details)

7. The major requirements of customers for the transport services (please specify1.2.3……according to the degree of importance)

□low price □simple procedure □cargo safety □delivery in time
□door-to-door service □low rate of cargo damage and loss □other

8. In your opinion, what types of logistics services are needed by the customers besides of transport service? (multi-choices, please specify 1.2.3……according to the degree of importance)

□storage and warehousing □packaging □processing □distribution
□timely delivery □cargo tracking □ other (please note in details)

II. Your understanding of the concept of logistics:

9. Your view on logistics:

□A new organization and management technology
□traditional transport + other services □multimodal transportation
□a modern terminology of "transport" □not clear

10. The benefits of developing logistics for transport company lie in:

□ long term development □improve competition □improve the profits
□ improve popularity □stabilize market share □other (please note in details)

11. Does your company plan to develop logistics services?

□yes □no

12. Currently, what are the most needed for your company to develop logistics services?

□support from the government □complete logistics infrastructure
□logistics information system □orderly market competition
□other (please note in details)

13. What could be your present strategies if your company would develop in logistics?

□express transport □transportation + agent □ transport + storage
□transport + distribution □transport + storage + distribution
□transport + other services □other (please note in details)

III. Enterprises resources

14. Your company resources:

Number of employees_____, Number of logistics center_____

15. Utilization of the transport logistics facilities and equipment in your company:

Utilization of warehouse _____;
Utilization of dedicated railway _____;
Ratio of empty backhaul_____;
Utilization of transport vehicles_____.

16. Does your company have logistics information system?

□yes □no

17. The main function of the logistics information system in your company:

□daily business transaction □inquiry □long-distance communications
□decision-making and analysis □other (please note in details)

18. Which type of logistics service will be supplied to customers by your company in the future?

□storage and warehouse □inter city transport □in-city delivery
□packaging and processing □restructuring logistics system □bar coding
□logistics information management □material quality inspection
□customs clearance □invoicing □other (please note in details)

19. The main business transacted by the logistics information system in your company:

□storage and warehousing management □inventory management
□transport management □finance and accounting management
□other (please note in details)

IV. Service attributes of your company

20. How long will it take in responding to a complaint in your company?

□in 24 hours □in 48 hours □in 72 hours
□over 72 hours (please explain the reasons)

21. How long will it take in responding to an inquiry of compensation in your company?

□in 24 hours □in 48 hours □in 72 hours
□over 72 hours (please explain the reasons)

22. Transshipment efficiency in your company is

□ very high □ high □ moderate □ low

23. The frequency of vehicle and liner services supplied by your company is

□ very high □ high □ moderate □low

24. Cargo pick-up from customers in your company is

□ in time □ relatively in time □ not in time □ not clear

25. The rate of the punctuality of vehicle and liner ships in your company is

□more than 98% □ 90%-98% □ less than 90%
□other (please note in details)

26. The accuracy of documentation in your company is

□more than 95% □85%-95% □75%-85% □less than 75%
□other (please note in details)

27. Does your company issue the documents quickly?
□yes □no

28. The courtesy of your company's servants answering the inquiry from the customers is
□very polite □polite □moderate □not polite

V. Potential of improvement of your company

29. Does your company have the ability of customs clearance?
□yes □no

30. Does your company have the ability to provide the integrated logistics services?
□yes □no

31. Does your company provide door-to-door services?
□yes □no

32. Does your company provide Just-In-Time services?
□yes □no

33. Transport capacity controlled by in your company is
□very large □large □moderate □small

VI. Services quality of the marketing staff

34. The frequency of visiting cargo owners
□frequently □often □moderate □seldom □rarely

35. The ability to solve problems of your company's marketing staff is
□very strong □strong □moderate □poor

36. The courtesy of the marketing staff in your company is
□very good □good □moderate □poor

VII. The capabilities of providing integrated logistics services and value-added services

37. Does your company have road transport capacity?
□yes □no

38. Does your company have long-term contracts with inland container depot?
□yes □no

39. Does your company have long-term contracts with railway companies?
□yes □no

40. Does your company own any dedicated terminal in ports?

□yes □no

41. Does your company have slot chartering agreement with other shipping lines?
□yes □no

42. The proportion of building up long-term cooperation between the cargo owners and your company is
□very high □high □moderate □low

VIII. Pricing policy

43. Does your company adopt low pricing policy?
□yes □no

44. Does your company respond to the price inquiry fast?
□yes □no

45. Does your company have flexible pricing policy in responding to the price competition?
□yes □no

IX. Logistics facilities and equipments in your company

46. Does your company have the ability to handle the non-standard parts (with over- length or over-height)?
□yes □no

47. Does your company have the capability of providing cargo tracking service?
□yes □no

48. The rate of cargo damage and loss in your company is
□less than 1% □1-3% □3-5% □5-10% □more than 10%
□other (please note in details)

X. The main type of promotion channels

49. The main type of promotion (marketing) channels adopted by your company includes (multi-choice)
□newspaper □magazines □Internet
□other (please note in details)

XI. Suggestions for administration and policy for Chinese transport logistics industry

50. What's the main barrier to hinder the development of Chinese transport logistics? (multi-choice)
□lack of qualified logistics human resource
□segmented administrative regime
□deficiency of transport logistics infrastructure
□underdeveloped outsourcing market

□incomplete regulations
□market monitoring and control
□restrictions from local government and regional protectionism
□others (please note in details)

51. What policy and rules on Chinese transport logistics should be completed or revised?

□logistics standardization
□logistics industrial policy
□rules of E-business
□logistics market admission management
□logistics market supervision system
□others (please note in details)

Please tell us your suggestions in developing Chinese transport logistics industry:

If you wish, please enter your contact information below to get notified if any
Telephone:
Fax:
Address:
E-mail:
Website:

Annex 2: Questionnaire on Choice of Flag

Questionnaire form on Choice of Flag

1. Basic Data

Name:
Position:
Company:

2. Please fill in the marks on all factors of Table 1 in a scale of 1 (unimportant) to 5 (very important)

Table 1: Query form for experts on the relative importance of factors affecting the choice of flag

Factors	Quantitative scale
Crew costs saving advantages	
Costs for meeting the maintenance and safety requirements /bureaucratic control	
Capital* , insurance and other costs	
Easiness of bank finance	
Fiscal advantages	
Labour quality and availability	
Vessel characteristics (age, size and type, etc.)	
Trading region of world	
Public relations	
Country specific comparative advantages (subsidies, economic power and structure etc.)	
Political considerations	
Union considerations/ recognition	

**In countries where import taxes are applicable.*

3. *Please give the preference degree and score for the three policy alternatives of Table 3 as shown below (Table 2), for each factor in Table 3 according to degree it affects your choice of flag decision.*

Table 2: Preference degree and score for the three policy alternatives

Preference degree	Score range
Very high	90~100
Quite high	80~89
Rather high	70~79
high	60~69
low	50~59
Rather low	40~49
Quite low	30~39
Very low	20~29

For example, if according to your experience, the crew cost saving for a ship under an open registry has a great advantage compared to the other two alternatives, you may give the preference degree "very high" and a score of, say, "95". For the other two alternatives, "national registry" and "second registry", you may, and then give the preference degrees "rather low" and "high", and scoring, say, "48" and "67" respectively.

Table 3: Query form for experts to evaluate the preference of factors affecting the choice of flag in terms of 3 registry alternatives

Factors	National registry		Second registry		Open registry	
	preference degree	score	preference degree	score	preference degree	score
Crew costs saving advantages						
Costs for meeting the maintenance and safety requirements /bureaucratic control						
Capital , insurance and other costs						
Easiness of bank finance						
Fiscal advantages						
Labour quality and availability						
Vessel characteristics (age, size and type, etc.)						
Trading region of world						
Public relations						
Country specific comparative advantages (subsidies, economic power and structure etc.)						
Political considerations						
Union considerations/ recognition						

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Summary in Chinese（中文摘要）

中国交通运输物流框架体系重构与协调机制研究

计划、采购、制造和营销等经济活动的全球化，使得生产、流通企业纷纷构建全球战略物流网络，目标是对世界上任何一个市场的需求都能做到高效率、高质量的快速反应。高效的、一体化的现代物流体系正逐渐成为全球竞争力的核心内容。现代物流是一个通过不同的经济活动（如计划、控制与实施），对资源从原产地到最终消费者的有关选址、移动和存储业务进行的优化过程。其实质是货物的有效流动，而这恰恰是运输的基本功能。因此，全球化、综合物流以及信息和通讯技术的发展在改变以往的商业模式和贸易物流的同时，也在改变着运输服务的功能，并为包括发达国家和包括中国在内的发展中国家的运输服务提供者创造了新的市场发展空间，也提出了更高的服务要求。随着现代物流在推动国民经济发展中的重要性程度的不断提升，处于高速增长时期的中国经济对物流发展的依赖程度也与日俱增 。这为中国交通运输业发展物流提供了重大机遇。因此，物流的发展已引起中国政府交通运输主管部门的高度重视，并已开始系统、深入地考虑中国现代物流发展的现状、问题与对策。

在这一背景下，如何通过借鉴国外物流发展的成功经验，在结合中国具体国情的基础上，开展旨在重构中国交通运输物流发展框架体系，实现运输物流运作一体化的研究，尤其是对政府交通主管部门应如何建立和完善物流运作机制与物流基础设施规划建设机制，加强物流系统中各节点的有机协调与配合，从而从宏观上积极推进中国现代物流的发展，建立结构合理、功能完善、运转高效、环境友好的交通运输物流网络，具有十分重要的紧迫性。

本研究概要分析了交通运输物流体系的理论框架，描述交通运输物流框架体系的构成、各组成要素间的结构层次关系，在此基础上，基于广泛的调查研究和文献资料的收集整理，对中国交通运输物流框架体系各组成要素现状进行了分析，尤其是通过对中国交通运输企业开展物流服务的问卷调查结果进行统计分析，分别对中国交通运输物流主体、交通运输物流客体、交通运输物流市场机制、基础设施平台、信息平台以及政府宏观管理体制环境和政策法规环境的现状及其存在的问题进行了全面系统的阐述。

从市场主体看，中国交通运输物流市场主体力量还相对薄弱，首先供给主体主要是由传统的运输企业转变而来，其服务功能单一，增值服务能力弱，不能提供全国范围内的整合物流服务；其次由于许多大中型国有生产型和流通型企业他们都还采取自营物流模式，不能形成大量有效地物流需求，供需双方力量都不够大，不能推动物流市场进一步向前发展。在基础设施方面，尽管中国交通运输物流基础设施经过改革开放 30 年的

发展，已经基本达到适合国家经济发展的需要，但对于发展现代物流所提出的高要求，以及中国加入 WTO 后所面临的竞争环境而言，仍然还存在许多不足之处，比如总体规模仍然不足，运网密度较低，不同基础设施之间的连接不够，现代化程度偏低，单位交通运输物流基础设施负担重，地区性发展不平衡等。

从市场竞争格局看，通过对物流市场的调查发现，虽然中国交通运输物流市场上竞争主体很多，各种各样的物流企业纷繁芜杂，但是总的来说，竞争并不是非常的激烈，竞争格局为多层次竞争。也就是说，不同实力的物流公司面临着不同档次的客户，市场细分非常明确。具体来说，可以分为三个层次的竞争：高层次竞争，多为国有大型企业或者是外资物流企业，主要针对的大多是大客户、大项目，竞争相对激烈；中层次竞争，大多为由货运代理公司转化而来物流企业，其服务对象基本上以三资企业为主，经营进出口物流；低层次竞争，主要是一些直接从事简单物流操作的公司。这些公司大都规模较小，但拥有自己的车队或仓库。在这一层次的竞争不太规范，多是围绕价格进行竞争，需要加强市场监督。

在管理体制上，中国物流产业仍然是分散的或者称多元的管理方式，涉及国家发展和改革委员会、交通部、铁道部、民航总局、商务部、海关、工商、税务、国家安全生产监督管理局等十几个部门，政府管理职能整合不足的问题非常突出，虽然商务部的建立是一个很好的尝试，但是现代物流业是一个跨部门、跨行业、跨地区的产业，需要各个方面相互配合和支持形成一个合力，各部门需要建立一个高层次的协调机制，将政府相关管理机构的职能进行相应整合，形成一个合力来推动物流业的发展。

运输需求作为一种派生性需求，其增长与经济增长有很强的正相关性。但是，运输在促进经济增长的同时也产生许多对环境、土地使用、人身健康等的副作用以及负的外部性，如道路拥挤、环境污染、噪音、土地占用等。可以说，经济增长将能带动社会福利的增长，但经济增长对运输需求的增长所产生的负的外部性，又可以降低社会福利。因此，如果不采取有针对性的措施，那么随着工业产值的增加和对外贸易的增长，势必增加对运输的需求，最终导致运输的负外部性效应的增长。因此，弱化经济增长和运输增长之间联系，降低经济增长与运输增长之间的相对比率已成为发达国家，尤其是欧洲未来运输发展政策的重要取向。近年来，随着中国经济的高速增长，运输需求也在不断增加，尤其是公路运输迅猛发展，导致诸如土地占用、环境污染、噪音等运输负外部性正越来越明显。因此，中国亟待构建可持续发展的环境友好型综合运输体系，充分发挥各种运输的比较优势，优化运输结构，通过采取有效的政策措施，包括加快铁路运输体制改革等举措，促进货物运输从对环境影响较大的运输方式（公路）向内河航运以及铁路运输等负外部效应相对较小的运输方式转移。

为改善诸如铁路运输、水路运输等环境友好型运输方式的服务质量和水平，提高他们与公路运输的竞争能力，建立一个真正的综合运输体系，中国必须采取优化交通运输政策，提高政策竞争力。以水路运输为例，由于这种运输方式目前尚未很好融入综合运输体系，因此通过采取有效的海事管理政策，吸引移籍海外的中国籍船舶回国登记，这

必将有助于提升中国海上运输业的竞争力，并有助于促进中国水路运输与物流供应链的一体化。目前中国90%的外贸进出口都是有由海上运输完成的。因此，寻求优化合理的海上运输政策将有利于提升国家综合运输系统的整体绩效水平。

和绝大多数传统海运国家一样，中国船舶移籍由来已久，尤其是 1994 年实行新税制后,我国船舶海外移籍的状况也日趋严重,已超过了中国从事国际海运船舶的半数。由于在法律上,悬挂外国方便旗船舶视同外轮,因此，中国政府无法对移籍船舶进行宏观调控和有效监管,安全技术标准难以落实,同时也给国家税收、船员就业等造成影响。中国船舶移籍的原因不同于传统海运国家,国内制度环境制约了中国航运业的发展。鉴于航运业在国民经济和对外贸易中的重要地位和较强的产业关联特性 ， 非常有必要通过航运政策调整与制度安排来优化我国的船舶移籍规模。其中包括对进口船舶在关税和增值税方面采用免税或低税政策，对海运教育与船员培训给予扶持政策，对国际航行船舶实施船吨公司税制。尤为重要的是，借鉴欧洲国家的成功经验，引入欧洲各国普遍采用的第二船籍制度,通过提供一系列优惠措施来吸引船舶回籍,壮大国轮船队。

发展现代物流正得到中国广大运输企业，尤其是国有大中型航运企业的高度重视，大多数运输企业都对物流有了较为正确和深远的认识，认为开展物流服务有益于提高企业的竞争力和长远发展。当前，中国交通运输企业正面临中国加入世贸组织，运输物流市场的开放度不断加大，国外运输企业纷纷抢滩中国物流市场的的挑战，为此，中国交通运输企业应充分发挥自身优势，合理进行战略定位，重构业务流程和经营模式，提高市场竞争力。目前，中国的一些大、中型以及新兴发展的小型运输企业已开始寻求物流发展的道路，并涌现出一些成功的典范。这些企业在其确定运输为主业的同时，致力于向物流服务多元化发展。为达到与客户“双赢”的目标，他们以客户满意为中心，共同优化业务流程，推出“门到门”一站式综合物流服务。从而与客户建立了良好的合作伙伴关系，并直接为客户创造价值。

中国交通运输物流处于刚刚起步阶段 ，能否在发展的初期就能步入正常的运行轨道，与交通运输物流市场信息导向系统——景气监测预警机制的建立与否及运行的效果有很大的关系。因此，有必要建立一套中国交通运输物流市场景气监测预警系统。通过建立有效的经济指标体系和社会监控体系，该系统将对交通运输物流市场内各物流环节的运作效率、市场经济指标、物流供需量等重要数据的进行监测，分析物流市场的运行状况，把握整个市场发展动态，研究一些经济、政策等因素变动对物流市场的影响，规范企业的竞争行为，如果有“异常”出现，要及时警示行业主管部门，在全社会范围内采取防范与调整措施，遏制各种风险的进一步恶化。中国交通运输物流市场景气监测预警系统景气指标的选择要分别从在不同的方面反映中国运输物流市场的发展规模、运行质量和水平。本着重要性、敏感性、时效性、全面性、可行性等原则，本研究构造了以物流量指标、经济指标、安全指标、物流企业运行效率指标四大指标为主体的评价指标体系，并进行了实证分析。

Summary in Dutch (Nederlandse samenvatting)

Richting een herstructurering van en coördinatie mechanismen voor het Chinese transportwezen

Steeds meer vraag naar geïntegreerde wereldwijde logistiek heeft geleid tot de ontwikkeling van een aanzienlijke markt voor logistieke diensten, niet alleen in de traditionele industrielanden, maar ook in de opkomende welvarende ontwikkelende economieën, zoals China. Met haar opkomst als een wereldwijd fabricage-centrum, is China bezig om haar logistiek kanalen, die steeds mondialer worden, te herstructureren. De stuwende rol van logistiek in de ontwikkeling van de nationale Chinese economie is de afgelopen tien jaar duidelijk zichtbaar geworden. Als zodanig is de afhankelijkheid van de Chinese economie, die zich ontwikkelt op topsnelheid, van logistiek gestaag gestegen. Dit momentum betekent een grote kans tot groei van de Chinese transport sector, en maakt een herstructurering van de architectuur van de Chinese transport logistiek (ACTL), waarbij rekening wordt gehouden met zowel de kenmerken van het transport als met de eisen van logistiek, noodzakelijk.

Binnen de ACTL is enerzijds de bouw van twee basisplatforms – de infrastructuur en informatieuitwisseling – van groot belang voor de ontwikkeling van de Chinese transport logistiek. Anderzijds worden regelgeving en beleid, die kunnen worden gezien als de software van de ACTL, steeds belangrijker in de zich ontwikkelende logistieke markt. Dit omvat regels voor het bestuur van en de controle op de markt, toelating toe dan wel terugtrekking uit de markt, coördinatiemechanisme tussen diverse uitvoerings- en beheersinitiatieven en tenslotte standaardisatie en normalisatie.

Uit een in het kader van dit onderzoek uitgevoerde enquête blijkt dat het begrip `logistiek' bij Chinese transportbedrijven steeds beter wordt begrepen. De krachtige ondersteuning van de overheid en veel publiciteit hebben ervoor gezorgd dat de meerderheid van de Chinese transportbedrijven gedegen kennis van logistiek hebben opgebouwd en dat de meeste transportbedrijven het belang en de urgentie van logistieke dienstverlening, die tegemoet komt aan de behoeften van de klanten, begrijpen.

De Chinese markt voor transport logistiek kent verschillende soorten logistieke ondernemingen die elkaar beconcurreren. Het niveau van competitie tussen deze ondernemingen kan worden geclassificeerd als hoog, midden en laag. Ondernemingen, die op hoog niveau wedijveren, richten zich voornamelijk op grote klanten en grote projecten/oplossingen. De competitie op het midden niveau richt zich op multifunctionele logistieke diensten voor multimodaal container transport en expeditie diensten. Op het lage niveau van competitie houden de bedrijven zich bezig met eenvoudige logistieke handelingen.

Samen met de globalisering en de toenemende behoefte aan concurrentievermogen, is het essentiëler dan ooit dat landen hun logistieke kwaliteit verhogen en de transactiekosten terugdringen door het realiseren van adequate en efficiënte systemen voor intermodaal vervoer. In dit opzicht wordt intermodaliteit steeds meer de kern van de meeste geavanceerde logistieke strategieën die worden gebruikt door de grootste transportbedrijven ter wereld (OECD, 2001). Bijgevolg is de kwaliteit van intermodaal vervoer logistiek een essentieel aspect waarmee rekening moet worden gehouden bij de herstructurering van de architectuur van de Chinese transport logistiek (ACTL).

Om te voldoen aan de eisen van een duurzame intermodale verschuiving zijn onder andere de Europese beleidsmakers en onderzoekers steeds meer bezig met aangelegenheden betreffende de ontkoppeling van economische activiteit en vervoersactiviteit met het oog op de vermindering van de congestie en andere negatieve neveneffecten van het vervoer (Gilbert et al.., 2002). Gezien de snelle groei van het wegvervoer en het effect ervan op het milieu en het grondgebruik in China, is in dit onderzoek het strekking en de haalbaarheid van de ontkoppelingsinitiatief bekeken. Uitgaande van de cijfers uit dit onderzoek is gebleken dat het verband tussen het totale goederenvervoer en de economische groei in China niet zo sterk is als in Europa, hoewel er geen bewuste inspanningen door de Chinese regering zijn gedaan om de koppeling te verzwakken. Met betrekking tot de mogelijke redenen achter het zwakke verband tussen de vraag naar vervoer en de Chinese economie, kan het volgende worden overwogen: het verlagen van het gewicht van de lading voor verscheping, met name grondstoffen voor de zware industrie, zoals het wassen van steenkool, het omzetten van boomstammen naar gezaagd hout, en de concentreren en smelten van delfstoffen, concentratie van de groei van de kust, de structurele verschuiving van het BBP naar sectoren die minder transportintensief zijn, en meetfouten in statistieken voor wegtransport (Huenemann, 2001).

Hoewel de intensiteit van het vrachtvervoer in China de afgelopen jaren gestaag is gedaald, is deze nog altijd aanzienlijk hoger dan die van de VS en de EU. Dit gezegd hebbende, zou het verschil niet zo groot zijn in termen van koopkracht van de Chinese munt (RMB). In deze context dient de Chinese regering in het licht van de snelle economische groei doelgerichte maatregelen te nemen om transport en economische activiteit te ontkoppelen. Mogelijke maatregelen zijn dematerialisering van de economie; het verhogen van de kosten van het vrachtvervoer over de weg; het revitaliseren van spoor-, vracht-organisatie en integratie technieken; promotie van schonere technologieën voor motorvoertuigen; en de oprichting van de lokale productie ‘clusters’ (Ballingall ea., 2003). De maatregelen die de EU voorstelt voor een duurzame logistiek kunnen China behulpzaam zijn bij het ontwerpen van een duurzaam (intermodaal) transport systeem. Gegeven de snelle groei van de economie en de buitenlandse handel zijn niet alle EU maatregelen, zoals bijvoorbeeld het terugdringen van de vraag naar wegvervoer, even praktisch voor China. Bovendien moet aandacht worden besteed aan de ontwikkeling van afgelegen gebieden, waar de vervoersinfrastructuur te weinig capaciteit heeft om aan de vraag te voldoen en er nog een behoefte aan modernisering is. Voor een gunstiger intermodale verschuiving lijkt het erop dat er in deze fase belangrijke investeringen moeten worden gedaan in speciale vracht spoorwegen en waterwegen in China.

Om te kunnen spreken van ware intermodaliteit dient de kwaliteit van de meer milieuvriendelijke vervoerswijzen per spoor en over het water te concurreren met het wegvervoer. Om de kwaliteit van het vervoer per spoor en over het water te verbeteren zijn passende beleidsmaatregelen nodig. Voor de Chinese scheepvaartsector, die nog niet perfect geïntegreerd is in het landelijk transport logistiek netwerk, kan beleid gericht op maritieme veiligheid, alsmede op de terugkeer van de schepen onder Chinese vlag, de integratie van internationale scheepvaart in 'one-stop shop' logistieke ketens bevorderen. De scheepvaart is de meest voorkomende vorm van vervoer voor de internationale handel en, inderdaad, meer dan 90 procent van China's buitenlandse handel vindt over zee plaats. In dit opzicht is het vinden van een optimaal alternatief beleid is uiterst belangrijk voor het maximaliseren van de gemiddelde prestatie niveau van een transport logistiek systeem.

Zoals in de meeste andere landen heeft ook in China het onder vreemde vlag gaan varen ernstige negatieve effecten op de nationale scheepvaart en de nationale economie. China kan voor het aanpassen van hun scheepvaartbeleid leren van de ervaringen van andere landen die een dergelijke ongunstige ontwikkeling eerder hebben meegemaakt. Voor een dergelijke herziening van het beleid moet gebaseerd zijn op een evaluatie van de economische, sociale en politieke gevolgen van de scheepvaartregistratie alternatieven. De mogelijke maatregelen omvatten gunstige regelingen voor nieuwbouw, belastingvrijstellingen voor schepen in internationale handel, vrijstelling van de sociale lasten voor zeevarenden, vennootschapsbelasting op basis van het tonnage, en een grotere steun voor maritiem onderwijs en opleidingen om de vaardigheden op pijl te houden en een flexibele arbeidskrachten. Tenslotte zou het oprichten van een parallel register, langs de lijnen van de Europese ervaring, zoals voorgesteld in dit paper, kunnen helpen bij het aantrekken van Chinese schepen.

Zonder gekwalificeerde transportlogistieke dienstverleners die in staat zijn een hoogwaardige geïntegreerde logistieke dienstverlening te verzorgen, kan China's transportlogistieke sector niet voldoen aan de behoefte aan logistieke diensten met toegevoegde waarde van zowel de nationale economie op macroniveau en klanten / verladers op microniveau. In een veranderende logistieke markt, moeten de rol en positie van de Chinese maritieme sector worden vastgesteld in het licht van zijn sterke en zwakke punten.

De Chinese scheepvaartsector heeft herstructurering van de geboden diensten en de organisatie gepropageerd teneinde concurrentievoordelen te behalen in een zeer dynamische marktsituatie.

Hiertoe moet een doeltreffend promotie mechanisme, dat voorziet in een manier om toonaangevende logistieke dienstverleners met 'best practices' te stimuleren en te koesteren, worden opgezet en steeds meer geperfectioneerd, om de overgang en de bevordering van de Chinese logistieke ondernemingen te versnellen (Yang, 2007). Buitenlandse transportlogistieke ondernemingen, met een rijke ervaring aan `best practices' in de logistiek en geavanceerde logistieke managementvaardigheden, zouden moet geïntroduceerd in de

Chinese logistieke sector door middel van samenwerkingsverbanden, allianties, fusies en overnames. De Chinese rederijen en logistieke bedrijven zullen hun lage productiviteit en efficiency moeten verbeteren door hun technische en managementvaardigheden te verbeteren. Daarnaast moeten ze hun sterk uitbuiten zoals hun uitgebreide binnenlandse dienstennetwerk, in het bijzonder voor de grotere bedrijven, ruime transport en opslagfaciliteiten, goede relaties met de lokale en centrale overheden alsmede binnenlandse verladers, en de lage exploitatiekosten.

In de afgelopen paar jaar hebben de Chinese grote staatstransportbedrijven, samen met middelgrote en kleine transportbedrijven, stappen gezet om hun logistieke activiteiten te herstructureren en hebben zij een actieve rol gespeeld bij het verlenen van logistieke diensten met toegevoegde waarde door gebruik te maken van hun sterke punten ten aanzien van voorzieningen, bestaande aanwezigheid, human resources, lage kosten en service netwerken.

Vergeleken met de traditionele markt voor vrachtvervoer, verkeerte de (transport) logistieke markt in China is nog in de beginfase. In een dergelijke onvolwassen markt is het dan ook van groot belang om de industrie in deze vroege fase van haar ontwikkeling op het juiste spoor te zetten door middel van een effectief systeem dat markt informatie bewaakt en begeleidt (IMG). Op basis van de ‘early-warning’ theorie en praktijk is in dit onderzoek een theoretische basis gelegd voor de invoering van een dergelijk systeem, voor het organisatorische model en voor de operationele patronen voor het monitoren van het succes van de transport logistieke markt. Er is een systeem ontworpen voor het verzamelen van informatie over de beschikbaarheid van gegevens in het IMG. Hierbij heeft het onderzoek zich gericht op het ontwerp en werking van PDI en PS modellen van IMG. In het bijzonder is de toepassing van PDI en PS modellen op basis van statistische gegevens van de Chinese transportlogistiek markt van de afgelopen tien jaar onderzocht.

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Jiaqi Yang was born and raised in Ezhou, Hubei Province, P. R. China. He received his Bachelor of Science Degree (BSc) in Maritime Transport Management from Shanghai Maritime University in 1986. He started studying Transport Management in 1990 at Wuhan Transportation University (currently Wuhan University of Technology, WUT) and obtained his Master of Science Degree (MSc) in 1993. After one year of study at the Sweden-based World Maritime University, he received his second Master of Science Degree (MSc) in Shipping Management in 1996. Since the beginning of 2002, he has been pursuing a part-time PhD study in Maritime Economics and Logistics at Erasmus University Rotterdam in the Netherlands under the supervision of Professor H.E. Haralambides.

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TOWARDS THE RESTRUCTURING AND CO-ORDINATION MECHANISMS FOR THE ARCHITECTURE OF CHINESE TRANSPORT LOGISTICS

With China's emergence as a global manufacturing centre, reshaping the country's logistics industry is assuming a global dimension too. The Chinese transport sector, despite its tremendous potential in facilitating the economic development of the country, is plagued with problems of insufficient infrastructure; overlapping regulatory authority; operational inefficiencies and a lack of logistics culture. The thesis shows that China urgently needs to restructure the architecture of its transport industry by incorporating logistics thinking and by embodying the strategic objectives of logistics development. Restructuring the architecture of transport logistics (ATL) aims to improve, the mechanism of integrated operations and planning, as well as the development of transport logistics infrastructure and facilities. Based on experiences from developed economies as a reference, and by integrating its own conditions and situation, the thesis argues that China needs to strengthen co-ordination and harmonization among the various components of its logistics system.

The architecture of transport logistics (ATL) consists of an integrated and coordinated system. The main function of the system is to accelerate interaction and coordination among transport logistics enterprises, government agencies, and relevant institutions at national level. This research presents a framework for the establishment of an efficient ATL system in China with appropriate structure, complete functions, and efficient operations. The presented framework focuses on the macroeconomic environment of transport logistics and supporting systems, presenting at the same time a monitoring and early warning system for effective pre-emptive decision making at policy level.

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Internet www.erim.eur.nl

Design & layout: B&T Ontwerp en advies (www.b-en-t.nl) Print: Haveka (www.haveka.nl)