2014

The prospects of development of the car carrier industry in China

Yan Liu
World Maritime University

WORLD MARITIME UNIVERSITY

Malmö, Sweden

THE PROSPECTS OF DEVELOPMENT OF THE CAR CARRIER INDUSTRY IN CHINA

By

Yan Liu

China

A dissertation submitted to the World Maritime University in partial Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(Port Management)

2014

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): .....

(Date): September 21, 2014

Supervised by:
World Maritime University

Assessor:
Institution/organisation:

Co-assessor:
Institution/organisation:

ACKNOWLEDGEMENTS

I am very lucky to study at World Maritime University in Malmo for fourteen months. I have become aware of some new meanings of life during my studies here.

I would like to extend my sincere appreciation to all organizations and kind people who supported and helped me during my studies and living in Malmo.

Above all, I would like to express my gratitude to China Shipping (Group) Company and China Shipping Tanker Company Limited for offering the precious opportunity and providing financial support for my attending the Port Management programme in WMU.

Furthermore, I would like to thank my distinguished supervisor, Professor Daniel S.H. Moon, who guided me in the structure of my dissertation invaluably and gave many good pieces of advice in detail. Dr. Patrick Donner and Ms. Inger Battista have paid serious dedication in checking the grammar of my dissertation; even punctuation mistakes have been corrected by them, for which I am extremely grateful.

I especially would like to thank my beloved husband Zhehai Zheng and my daughter Qingwen Zheng for their whole-hearted support as always. My husband helped me to collected data and gave me a great deal of advice during my writing. It would not have been possible to finish my dissertation without his support and encouragement, for which my mere expression of thanks likewise does not suffice.

Last but not least, I would like to thank the faculty and staff of WMU, who have unreservedly imparted knowledge to us and helped us in all aspects of our life. I really cherish the friendship of people from different countries, which makes life colourful in Malmo. I will be grateful forever for your love.

ABSTRACT

Title of Dissertation: **The Prospects of Development of the Car Carrier Industry in China**

Degree: **MSc**

The purpose of this dissertation is to analyse the possibility and necessity of developing China's car carrier fleet and to develop a strategic development plan for the Chinese car carrier industry.

China's automotive industry and car carrier fleet are introduced. The geographical distribution of automobile manufacturers and objective markets are studied. The difficulties existing in China's car carrier market and the reasons for the dilemma are analysed.

The global automotive industry is studied, including production, sales, seaborne car trade and their distribution and changes. The global car carrier fleet is researched, including the fleet capacity, orderbook, demolition and supply and demand relation. The advantages and disadvantages of the container and carrier transport modes are compared.

Japanese and South Korean experiences in automobile industry development and internationalization are explored. The successful cooperation models between major global automobile manufacturers and car carrier companies are investigated.

The SWOT analysis is applied to determine the possibility and necessity to develop China's car carrier fleet.

Additionally, a strategic development plan for China's car carrier industry is developed and recommendations are given on how to expand China's car carrier fleet. The importance of car carrier companies cooperating with automobile manufacturers and establishing steady long-term strategic relationships are addressed.

The concluding parts summarise the analysis of the prospects of development of the car carrier industry in China with recommendations. The limitation of the research is identified.

KEYWORDS : PCC, Car carrier fleet, Car carrier industry, Car carrier companies, Automotive industry, Automobile manufacturers, Competitiveness, Strategic development plan

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ANJI Logistics	Anji Automotive Logistics Co., Ltd.
ANSHENG	Shanghai Ansheng Automotive Shipping Co., Ltd.
BMW	Bavarian Motor Works
BTO	Build to Order
BYD	BYD Company Limited
CAAM	China Association of Automobile Manufacturers
CALA	China Automotive Logistics Association of CFLP
CDC International	CDC International Logistics Co., Ltd
CEU	Car Equivalent Units
CFLP	China Federation of Logistics & Purchasing
CHANGAN	Chongqing Changan Automobile Company Limited
CHERY	Chery Automobile Co. Ltd.
China Shipping	China Shipping (Group) Company
CIS	Commonwealth of Independence States
COA	Contract of Affreightment
COSCO	China Ocean Shipping (Group) Company
CSCC	China Shipping Car Carrier Inc.
CSC Group	China Changjiang National Shipping (Group) Corporation
CSC RoRo	CSC RoRo Logistics Company Limited
DFM	Dong Feng Motor Corporation
DPCA	Dongfeng Peugeot Citroen Automobile Company Ltd.
DRCSC	Development Research Center of the State Council
DNV	Det Norske Veritas
FAW	First Automotive Works
FAW Group	China FAW Group Cooperation
GAC Group	Guangzhou Automobile Group Co., Ltd.
GEELY	Zhejiang Geely Holding Group
GWM	Great Wall Motor Company Limited
HAIMA	FAW Haima Automobile Co., Ltd.
JAC	China Anhui Jianghuai Automobile Co., Ltd.
K-LINE	Kawasaki Kisen Kaisha, Ltd.
Mingsheng	Minsheng Shipping Co., Ltd.
MOL	Mitsui O.S.K Lines
NO_X	Nitrogen Oxides

NYK LINE	Nippon Yusen Kabushiki Kaisha
PCC	Pure Car Carrier
PCTC	Pure Car and Truck Carrier
PDI	Pre Delivery Inspection
PM	Particulate Matter
PPO	Post Production Option
SASAC	State-owned Assets Supervision and Administration Commission
SAIC	Shanghai Automotive Industry Corporation
SAE of China	Society of Automotive Engineering of China
SINOTRANS	China National Foreign Trade Transportation (Group) Corporation
SINOTRANS-CSC	SINOTRANS & CSC Holdings Co., Ltd.
SO_X	Sulfur Oxides
R&D	Research and Development
WTO	World Trade Organization
WWL	Wallenius Wilhelmsen Logistics

1 Introduction

1.1 Background of the research

1.1.1 The function of car carriers

The global seaborne car trade is generally served by Pure Car Carriers (PCCs), including Pure Car and Truck Carriers (PCTCs), which are designed to provide rapid vehicle loading and discharging by rolling-on and rolling-off.

When the demand for car shipping arose to a certain scale for the development of the global automotive industry and the trade of finished vehicles, the specialised vehicle shipping mode -- the car carrier came into being, which can provide high quality and effective shipping services with the advantages of being less affected by the weather and good adaptability to the terminal. Pure car carriers appeared in the 1960s and became the dominant means for vehicle transportation gradually (MOL, 2014). It has been more than 50 years since the first real sense of PCC was delivered. Car ro-ro transportation in terms of nature is service for the automotive industry. The growth of the global PCC industry was promoted significantly by the development of the automotive industry. The steady growth of the global automotive industry has provoked the world seaborne car trade to increase robustly over a long term. PCC has become the best professional tool for shipping vehicles. The major car carrier companies cooperate closely with the global large automobile

manufacturers and coordinate with their development strategy to provide sufficient vessel capacity and high quality service to meet their shipping demand.

1.1.2 China's car carrier fleet

The development of a car carrier fleet depends on the level of the automotive industry in a country. The automotive industry as one of the important pillar industries in China has been continuously strengthened with the scale of the automobile market expanding rapidly. China's automotive industry has developed dramatically in the last 10 years. Gross automobile industrial output value increased from 49.26 billion CNY to 3,315.52 billion CNY, more than 66 times, during the period of 1990 to 2010 (DRCSC, SAE of China, Volkswagen Group China, 2013). The production soared from more than 2 million cars accounting for 4.15% of the global production in 2001, to more than 22 million cars accounting for 25.33% in 2013, and sales were over 21 million cars in 2013, which was a brilliant achievement in the global automotive industry. China has become the largest automobile production country since 2009 and keeps this rank so far. The automotive industry structure was further optimized (CAAM, 2014; Liu, 2014). Like Japan and South Korea, China's rapid demand for car carriers emerged when the automotive industry grew to a large scale. However the development of capacity of the car carrier fleet was very limited compared to the auto production and sales in China.

China's car carrier fleet has 58 vessels with only 77191ceu car capacity before July 2014. Most of them are small vessels with a capacity less than 2000ceu. Nearly three fourths of the capacity is serving coastal and Yangtze River shipping. Only four vessels of more than 4000ceu with a total capacity of 19850ceu are serving for international shipping (CSCC, 2014). Most of China's car imports and exports are transported by global major car carrier companies. However, the Chinese automobile

manufacturers are subjected to double discrimination of vessel spaces and freight rates (Guiqing Zhai, 2008). The main transport mode in China is road holding more than 80% of car transportation. The waterways only account for around 7% of car transportation although 70% of passenger car sales were distributed along rivers or in the coastal areas of China (CALA, 2013). Thus, the PCC capacity in China is even surplus at present.

There is very important and practical significance to scientifically explore the development strategy for building China's car carrier fleet to provide logistics guarantee for China's automotive industry.

1.1.3 Global car carrier fleet

World seaborne car trade has grown robustly over a long-term, having increased by a compound average growth rate of 5.98% per annum in the period 1996-2013. Total seaborne car trade increased from 8.0 million cars in 1996 to 21.46 million cars in 2013. Meanwhile, the seaborne car trade in China grew even more dramatically from 0.065 million cars to 2.29 million cars in the same period (Clarkson Research Services, 2014).

The largest seaborne car trade routes are from Asia to Europe and North America. Historically, the most significant car exporters were situated in the Far East. Japan and South Korea are the principal exporters in the region. Europe and North America are significant exporters and importers (Clarkson Research Services Limited, 2013; Liu, 2014).

The global PCC fleet (including PCTCs) totalled 756 vessels with a capacity of 3.66 million ceu at the end of 2013 (Clarkson Research Services, 2014). The PCC orderbook for the next four years stood at 69 vessels with a combined capacity of

531,345ceu (car equivalent units, equal to car capacity) at the start July 2014, equivalent to 12.67% of the PCC fleet capacity in 2017 (Clarkson Research Services, 2014).

Ownership of the global PCC fleet is relatively consolidated. The international auto Ro-Ro shipping market is a highly monopolized market with a few large ship operators controlling most of the market share. The top ten owners control 64.29% of the total vehicle capacity of the global fleet (Clarkson Research Services, 2014). Japanese and South Korean owners hold more than 50% of the global fleet capacity (Clarkson Research Services Limited, 2013). The major operators can further control more capacity by time charter of vessels or share holding of other companies.

1.2 Purpose and objectives of the research

The purpose of this dissertation is to study China's current and future automobile market and car carrier fleet, global automobile market and car carrier fleet, compare the demand and supply of car carrier capacity, adopt the SWOT method to analyse the probability and the necessities of developing the car carrier fleet in China and the target markets. Suggestions will be given on development strategies of China’s car carrier fleet. The importance of car carrier companies cooperating with automobile manufacturers and establishing steady long-term strategic relationship will be addressed.

1.3 Structure of the dissertation

This dissertation consists of five chapters.

Chapter 1 introduces the function of car carriers and overviews the global and China’s automotive industry and car carrier fleet. The purpose and objectives of the research is clearly defined in this chapter.

Chapter 2 introduces the China's automotive industry and car carrier fleet in detail and analyses the dilemma existing in the car shipping market in China. The research is based on a review of significant previous reports on the analysis of China's automobile industry and car carrier fleet in the past and at present. The geographical distribution of automobile manufacturers and objective markets will also be studied. The difficulties existing in China's car carrier market and the reason for the dilemma will be analysed.

Chapter 3 researches the possibility and necessity of developing China's car carrier fleet. The global automotive industry will be studied including production, sales, seaborne car trade and their distribution and changes. Experiences of Japanese and South Korean automobile industry in the processes of development and internationalization will be researched. The global car carrier fleet will be studied including the fleet capacity, orderbook, demolition and supply and demand relation. The cooperation models between major global automobile manufacturers and car carrier companies will be investigated for their stable long- term relationships. Since container shipping is one of the dominant transportation modes in the world and has undertaken some of the car transportation, the advantages and disadvantages of the container and carrier transport mode will be compared. Qualitative analysis of the comparative strengths and weaknesses, opportunities and threats of developing the car carrier fleet in China will be followed based on the preceding research and studies.

Chapter 4 explores the strategic development plan for China's car carrier industry according to the previous analysis. Recommendations will be given on how to expand China's car carrier fleet. The importance of car carrier companies cooperating with automobile manufacturers and establishing steady long-term

strategic relationships will be addressed. Meanwhile, the optimum shipping routes will be analysed to gain profit in the short term and achieve sustainable development in the long term.

Chapter 5 makes conclusions on the prospects of development of the car carrier Industry in China with summary and recommendations. The limitation of the research will be mentioned.

2 Literature Review

2.1 China's automotive industry

2.1.1 History of China's automotive industry

2.1.1.1 The birth of China's automotive industry

China's first truck was made by First Automotive Works (FAW) branded as Jie Fang in 1956, and the first car came out in 1959 named Dong Feng, which was the symbol of the birth of China's automotive industry. Shortly after, China was isolated from the outside world for some historical reasons and lost the opportunity to develop through exchanging with and learning from other countries. As a result, China's automotive industry gradually fell behind the advanced automotive industry in the world (SOHU).

2.1.1.2 1978-1992: Exploring cooperation with foreign automobile manufacturers

The main automotive products made by China before 1980 were medium-sized trucks and the total output of cars and SUV was less than 5000 at that time. There was a big gap between Chinese and the global automotive industry in philosophy, management, technology and products. The Chinese government began to reform and change the development strategy to permit some of the domestic automobile manufacturers to introduce foreign advanced technology. In 1986, the government formally identified the automotive industry as a pillar industry and established the industrial principle as "high level of starting, large volume and specialization". Then

China’s car manufacture stepped on a way of introducing technology by joint ventures. The large auto groups, like FAW, SAIC (Shanghai Automotive Industry Corporation) and China's Second Automobile Group believed that it was an inevitable option to enhance the cooperation with foreign entities to cultivate the ability of research and development (R&D) for survival and expansion. Daimler Chrysler, Volkswagen, Peugeot, Citroen entered China one after another under this background (DRCSC, SAE of China, Volkswagen Group China, 2013).

Table1 Major Joint Ventures in China’s automotive industry

Joint Venture	Foreign Partners	Share Proportion of the Foreign Partners	Founded Date
Beijing Jeep Cooperation	Daimler Chrysler	31.35%	Jan. 15 1984
Shanghai Volkswagen Automotive Co., Ltd.	Volkswagen	50%	Oct. 1984
Guangzhou Peugeot Automobile Company	Peugeot	34%	Sep. 26 1985
FAW-Volkswagen Automotive Co. Ltd	Volkswagen	40%	Feb. 6 1991
Dongfeng Peugeot-Citreon Automobile Limited	Peugeot-Citreon	30%	May 18 1992

Source: (China.com, 2010; SHANGHAI VOLKSWAGEN; MBALIB; FAW-VW; DPCA, 2014)

2.1.1.3 1993-2001：overall development of cooperation between China and foreign automobile manufacturers

In 1994, China clearly confirmed in the Automotive Industrial Policies that China would encourage the development of the automotive industry by using foreign investment but the proportion of the Chinese shareholder should not be less than 50%. The six largest transnational groups (GM, FORD, DaimlerChrysler, Toyota, Volkswagen and Renault-Nissan), three powerful independent companies (Honda,

PSA Peugeot Citroen and BMW), the FIAT Group from Italy and the Hyundai Group from South Korea fell over each other when they entered China to build joint ventures with the state owned automobile enterprises. At this stage, the quality and technology of products made by joint ventures approached the levels of what was in the international market. A group of Chinese technical experts had been cultivated in the process of project introduction and exploration. However, the foreign partners still absolutely controlled the dominant technology in core aspects. The Chinese did not master the technology of finished automobile manufacturing (DRCSC, SAE of China, Volkswagen Group China, 2013).

2.1.1.4 2002 and after: further development

2002 was a milestone for China to promote the automotive industry when China joined the WTO. Thereafter, the Chinese government gave more preferential treatments to joint ventures to attract investment. Transnational automobile giants increased their investment in China after China joined the WTO and regarded China as an important part in their international strategies. They intended to fully explore the potential value of the Chinese market through comprehensive cooperation, all-dimensional participation, and full series of production. Volkswagen, GM, Toyota, Nissan, FORD, Hyundai and Honda have implemented their expanding plan in China vigorously since 2002. At this stage, the competition in China automobile market was very fierce, especially with the growth of domestic private car enterprises. The joint ventures repositioned China from technology support to international R&D centres in their strategies. The Chinese could also have their voice in the key point of research with the accumulation of technology, although foreign partners still controlled the initiative and the right to make decisions in developing products (DRCSC, SAE of China, Volkswagen Group China, 2013).

2.1.2 Current development of China’s automotive industry

After the automotive industry opened to the outside world, many joint ventures were set up to produce passenger cars, which led the industry to be segmented and decentralised, and finally resulted in low efficiency. Almost all large component manufacturers transferred to China, which therefore promoted overall synchronization development of Chinese car related enterprises. The technology of China’s automotive industry has been improved.

Nevertheless, joint ventures actually promoted China’s automobile techonlogy progress and self-owned brands growth positively. Their management philosophy and product development caused many excellent component manufacuturers to blossom and promoted overall development of R&D in China. China preliminarily mastered the car manufacturing technology then. On the other hand, the cooperation caused technological dependence on foreign partners and indirectly resulted in lack of motivation of innovation seriously (DRCSC, SAE of China, Volkswagen Group China, 2013). The competitiveness of China’s automotive industry needs to be improved.

2.1.3 The scale of China’s automotive industry

2.1.3.1 China’s automobile production and sales

China’s automobile production soared from 4.15% in 2001 to 25.33% in 2013 of the global production. China became the largest automobile production country in 2009 when China's automobile output reached 13.79 million, more than double the production of the US - the world's former largest automobile manufacturer, and has kept this rank until now. The automotive industry structure was further optimized. Both the automobile production and sales were over 21 million cars in 2013. The total

annual production increased by 14.79% to 22,116,800 cars and sales increased by 13.83% to 21,984,100cars (CAAM, 2014) (See Appendix A, Appendix B).

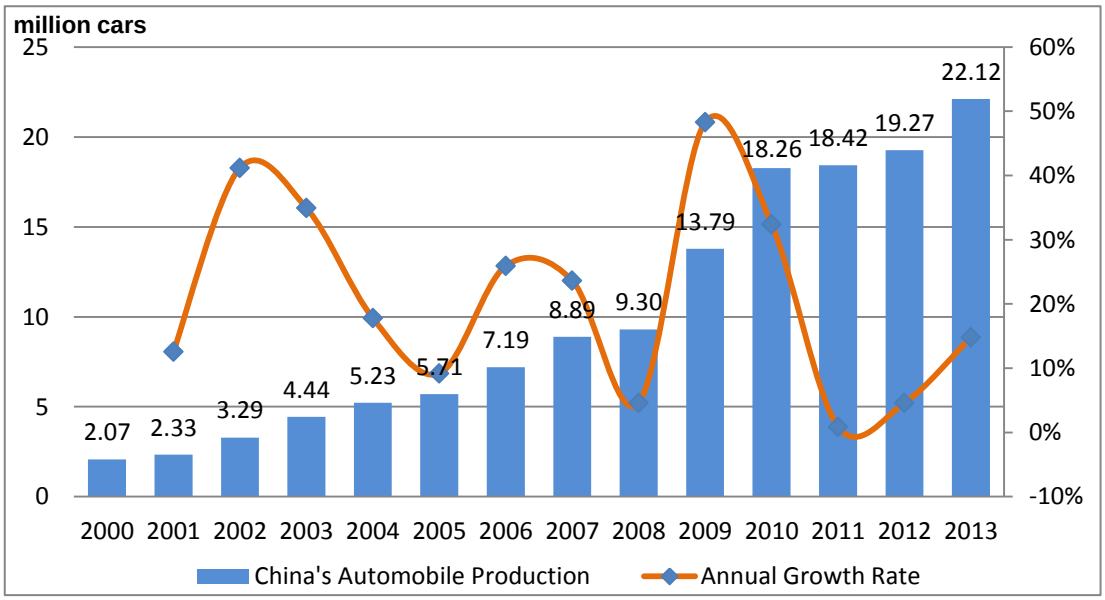


Figure 1 China's Automobile Production

Source: (CAAM, 2014)

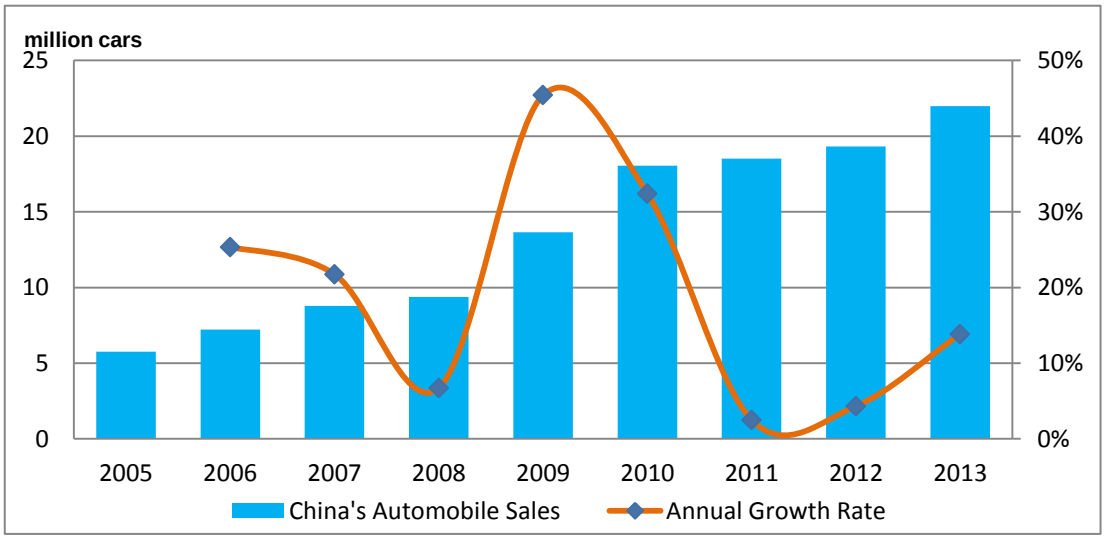


Figure 2 China's Automobile Sales

Source: (CAAM, 2014)

Table 2 Average Annual Growth Rate of China's Automobile Production and Sales

China's Automobile Production	Average Annual Growth Rate
from 2000 to 2013	19.99%
from 2009 to 2013	12.53%
China's Automobile Sales	**Average Annual Growth Rate**
from 2005 to 2013	18.23%
from 2009 to 2013	12.66%

Source: (CAAM, 2014)

2.1.3.2 Chinese main automobile manufacturers

The domestic market share was further concentrated by major automobile manufacturers. The top five manufacturers sold 15,831,100 cars, accounting for 72.0% of total car sales while the top ten sold 19,430,500 cars, accounting for 88.38% of total car sales in 2013 (CAAM, 2014).

Table 3 Top 10 Chinese Automobile Manufacturers in Sales in 2013

No.	Company	Sales (,000cars)	No.	Company	Sales (,000cars)
1	SAIC Group	5,073.3	6	GAC Group	1,004.2
2	DONGFENG	3,534.9	7	Brilliance-auto	777.4
3	FAW	2,908.1	8	GWM	754.2
4	CHANGAN	2,203.3	9	GEELY	549.4
5	BAIC Group	2,111.1	10	JAC	514.3
Total**(,000cars)**		19,430.5			
Percentage		88.38%			

Source: (CAAM, 2014)

2.2 China’s car exports and imports

2.2.1 The volume of China’s car exports and imports

China’s car exports started from the beginning of the 1990s with a small amount and increased rapidly after China joinded the WTO (National Bureau of Statistics of China, 2014). The exports always exceeded imports before 2009 and the fact was just the reverse after the financial crisis.

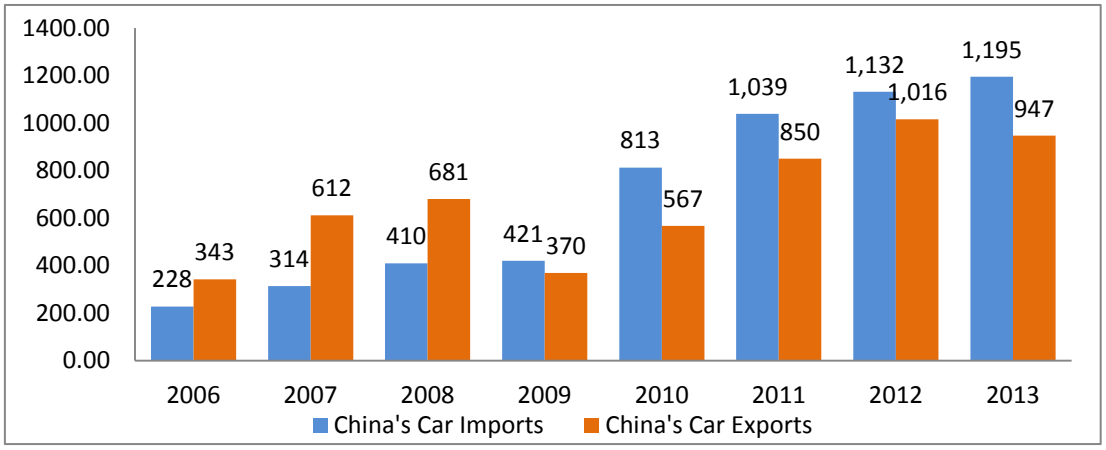


Figure 3 China’s Car Imports and Exports(,000 cars)

Source: (Cui, 2014)

China’s imports increased steadily and the annual growth rate was 5.56% in 2013. However, the exports dropped 45.67% in 2009 due to the financial crisis. From 2009 to 2012 the growth rate of exports was encouraging, although growth seems to have stalled in 2013. The exports reached 947,177 cars in 2013 (Cui, 2014).

The total exports broke one million cars in 2012, but it only accounted for 5.27% of domestic production while the proportion dropped to 4.28% in 2013 (Cui, 2014). This proportion is far behind that in South Korea (exports 70% of production) and that in Japan (exports 50% of production), and even falls behind that in emerging countries like Brazil and India. Among the exports, self-owned brands held a great share due to

the strict control on car exports constrained by the joint venture's contracts (DRCSC, SAE of China, Volkswagen Group China, 2013).

2.2.2 Chinese automotive products exports and imports value

In 2012, the global automotive products exports value was1,295,298 million USD and China exports value was 43,109.48 million USD, acounting for 3.3% of global automotive products export value，which was far below that of other major trading nations like Germany, the US, Japan and South Korea (WTO, 2014).

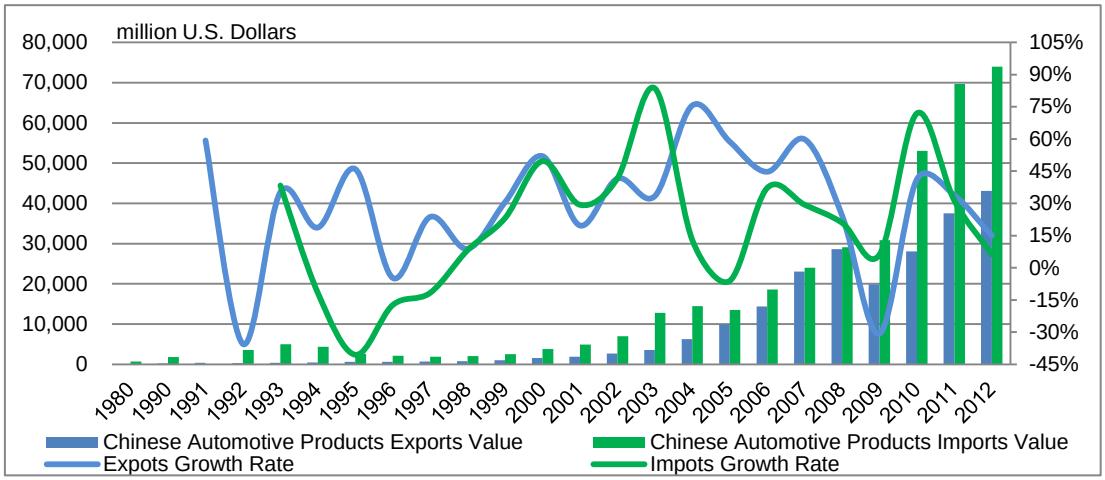


Figure 4 Chinese Automotive Products Exports and Imports Value from 1980 to 2012

Source: (WTO, 2014)

China's imports value was always higher than exports value although the exports/imports value ratio kept increasing from around 7% in the early 1990s to 98.51% in 2008. The ratio dropped sharply to around 50% after the financial crisis and slowly rose in 2011 and 2012. However, the gap between the volume of exports and imports is not so large, which means China's exports are mainly low value cars while imports are always higher value cars (See Appendix C).

It was a golden period for China's automotive industry to develop and enter the international market from 2002 when China joinded the WTO, to 2008 when the

financial crisis occurred. From then on, China struggled to take back the lost markets and exploit new markets; meanwhile, it seems that the domestic market has been more and more occupied by foreign automotive products.

2.2.3 Objective markets of exports

Chin's car export started from the Middle East. Over the past decade, Chinese automobile enterprises have been exploiting overseas markets in all continents except the mature markets in North America and Europe (DRCSC, SAE of China, Volkswagen Group China, 2013).

The Middle East (including West Asia and North Africa) and South America are the most important objective markets. The exports to the Middle East and South America were 294,251 cars and 273,828 cars accounting for 31.07% and 28.91% of the total exports in 2013 respectively. The exports to Europe was 143,415 cars, occupying 15.14% mainly to East Europe where Russia is located. The exports to other Asian areas was 133,125 cars holding 14.05% of the total exports in 2013. The exports to the above four areas accounted for 89.17% of the total exports in 2013 (Cui, 2014) (See Appendix D).

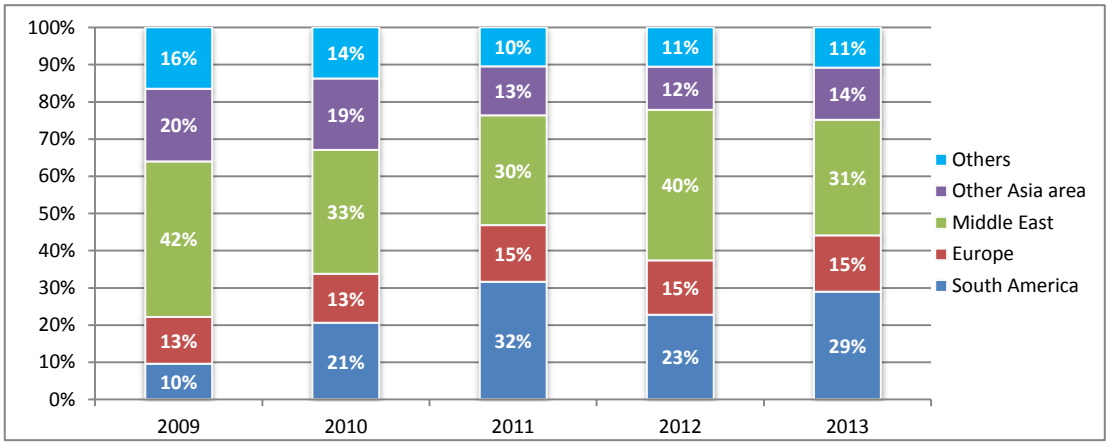


Figure 5 Chinese Automotive Products Exports Distribution

Source: (Cui, 2014)

There were some changes in the export markets in 2013.

- South America replaced Africa as the largest exports market of China, especially the south region of South America.
- The West Asian market suffered a setback by the influence of the issue of Iran-Iraq. The Asian markets have not been well controlled.
- In Africa, Algeria is the second largest automobile market after South Africa, and is China's largest market in Africa. Although there has been some turbulence recently, the profit is attractive for the price is comparatively high.
- The European market is limited to Chinese exports, except the Russian market.

Source: (Cui, 2014)

2.2.4 China's major car export manufacturers

Table 4 Top 10 Chinese Automobile Manufacturers in Exports in 2012

No.	Company	Volume (,000cars)	No.	Company	Volume (,000cars)
1	CHERY	184.8	**6**	DONGFENG	84.8
2	GEELY	100.8	**7**	JAC	57.2
3	GWM	96.5	**8**	GAC	53
4	SAIC	95.6	**9**	CHANGAN	51.9
5	LIFAN	87	**10**	BAIC	50.9
Total		**862.6**	**% of Total Export**		**81.9%**

Source: (CAAM, 2013)

Among the top 10 manufacturers, SAIC Group is headquartered in Shanghai and GAC group is in Guangzhou. The sales of the two Groups accounted for 27.64% of the total sales while SAIC Group alone accounted for 23.08% in2012. DONGFENG,

CHANGAN, JAC, CHERY and LIFAN are along the Yangtze River whose sales accounted for 30% of the total sales in 2012 (Liu, 2014).

2.3 China's car carrier fleet

2.3.1 Development of China's car carrier fleet

China's car carrier industry was initiated by Ansheng Automotive Shipping Company Limited and Changjiang National Shipping Corporation engaging in car shipping along the Yangtze River and coastal area with 500ceu car carriers from the start of the 21th century.

After China's joining the WTO, foreign automobile manufacturers expanded their operation in China gradually and they needed corresponding car shipping on the coast of China and internationally. Many large car carrier companies decided to set up joint ventures to circumvent China's cabotage policy to provide transportation services for their manufacture partners in China. Meanwhile, since Chinese shipping companies have little experience in car ro-ro shipping, they expected to learn from their foreign partners and obtain some cargoes by forming joint ventures.

Table 5 Initial Joint Ventures of Car Carrier Companies in China

Company	Partners	Funded Date
NYKCOS	COSCO NYK	October 2002
Orient Sea Highway Services Co. Ltd.	China Shipping NYK	November 2003
Sinotrans MOL	Sinotrans Group MOL	April 2004
CSC RORO	Changjiang National Shipping TOYOTA	June 2004

Source: (CNSS, 2012)

Later, the CSC RORO merged with Sinotrans MOL and founded the Sinotrans-CSC.

2.3.2 China's car carrier fleet

China's PCC fleet had 58 vessels with total a capacity of 77191ceu before July 2014. Most of them are small vessels with a capacity less than 2000ceu. The capacity of PCCs for coastal and Yangtze River shipping accounts for 43.41% and 30.94% respectively. There are only four vessels of more than 4000ceu with a total capacity of 19850ceu accounting for 25.65% of the total capacity (CSCC, 2014).

Table 6 China's Self-Owned PCC Fleet

Ship owner	Total Self-Owned PCCs		Foreign trade		Yangtze River		Coastal Trade		Coastal /Total capacity %
	No.	CEU	No.	CEU	No.	CEU	No.	CEU	
NYKCOS	4	17900	3	14950	0	0	1	2950	3.82%
Ansheng	15	10235	0	0	5	1630	10	8605	11.21%
Minsheng	12	6800	0	0	12	6800	0	0	0.0%
Sinotrans-cs	25	38062	1	4900	10	15312	14	17850	23.12%
CSCC	1	3294	0	0	0	0	1	3294	4.27%
CDC International	1	900	0	0	0	0	1	900	1.17%
Total	58	77191	4	19850	27	23742	27	33599	43.53%
Percentage%	100%	100%	6.90%	25.72%	46.55%	30.76%	46.55%	43.53%	

Source: (CSCC, 2014)

2.4 Difficulties and challenges in China's car carrier industry

2.4.1 The proportion of ro-ro shipping is very low

70% of passenger car sales were distributed along rivers or in the coastal areas which are the most prosperous regions in China. The distance between north China and south China in the coastal area is more than 3,000 kilometers. The total coastline of China is 18,000 kilometers. The distance from Chongqing to Shanghai along the Yangtze River is 2400 kilometers (CSC Group, 2005). Ro-ro shipping services can be provided by using the waterway. So far the main transport mode in China is road which holded more than 80% of car transportation. The waterway ro-ro transportation accounted for about 7% (CALA, 2013).

Table 7 China's Car Shipping volume by Ro-Ro vessels (,000 cars)

Year	2007	2008	2009	2010	2011	2012	2013
Coaster	310	330	390	628	727	737	940
Growth Rate		6.50%	18%	61%	16%	1.38%	27.54%

Source: (CSCC, 2014)

The manufacturers who attach importance to and take full advantage of ro-ro transportation are the following: FAW Toyota, GAC Toyota, Shanghai Volkswagen, Shanghai GM, SAIC Motor, GAC Honda, HAIMA and GWM (CSCC, 2014).

Table 8 Toyota's Production and Ro-ro Transportation in Coastal Area

Year	2009	2010	2011	2012	2013
Production	593,224	764,248	772,418	744,296	818,726
Ro-ro	180,158	229,138	241,281	211,732	235,935
Percentage	30.4%	30%	31.2%	28.5%	28.8%

Source: (CSCC, 2014)

Because of historical reasons, most of Chinese automobile manufacturers are located in the inland area. Among the top manufacturers, SAIC and GAC group are

headquartered in port cities. DONGFENG, CHANGAN, JAC, CHERY and LIFAN are along the Yangtze River. The geographical location determined that the dominant way of car transportation in China is by road. The proportion of ro-ro transport in the coastal area is less than 5% of the total sales in 2013 (Liu, 2014).

Table 9 Location of Top 10 Chinese Automobile Manufacturers in 2013

No.	Company	Location	No.	Company	Location
1	SAIC Group	Shanghai	6	GAC Group	Guangzhou
2	DONGFENG	Wuhan	7	Brilliance-auto	Shenyang
3	FAW	Jilin	8	GWM	Baoding
4	CHANGAN	Chongqing	9	GEELY	Hangzhou
5	BAIC Group	Beijing	10	JAC	Hefei

Source: (CAAM, 2014)

2.4.2 The car carrier companies cannot harmoniously develop with the demand of Chinese car exports

Chinese automobile manufacturers need the expansion of the car carrier fleet to support the automotive industry as well as car exports. The imbalance between car carrier capacity and the demand for transportation has seriously hindered the increase of Chinese car exports (Liu, 2014).

Car carrier companies in Japan and South Korea promoted their own countries' car exports, but this is not the case in China.The development of China's car carrier companies could not keep up with the pace of China's car exports in the past and cannot at present. The automobile manufacturers have to turn to foreign car carrier companies. China's manufacturers are having difficulties in finding enough space for exports in the highly monopolized international car carrier market (Liu, 2014). China's

shipping companies have had difficulties in meeting the needs of China's car exports almost all the time. China’s car exporters hardly ever found slots and they had to pay much higher freight rates than Japanese and South Korean automobile manufacturers (CNSS, 2012).

2.4.3 Reasons for the dilemma

2.4.3.1 China's car exports

On the one hand, China's car exports are in the primary stage.

- The features of China’s car exports are in small batches with wide spread destinations and mainly commercial vehicles. The exports was only 5.12% of the world seaborne car trade in 2013 (Cui, 2014; Clarkson Research Services, 2014). Furthermore the car export markets are in a wide range of areas with small quantities for each market. The main export objective markets are in South America, South-East Asia, Africa and Eastern Europe (Cui, 2014). Generally the exports are low-valued vehicles with limited profit margin which are sensitive to freight rate (CNSS, 2012). Therefore, China's shipping companies are unwilling to take the risk to invest in ocean lines. The batches began to increase in 2009, and sometimes 5000 passenger cars can be reached at once.
- China’s car exports are order-oriented, lacking plan and stability.
- The competition of Chinese automobile manufacturers in international markets is homogeneous because they have similar market segments. Their marketing strategy mainly depends on low price. The exporters cannot provide high quality services and have difficulty in growing stably even surviving in one market which has led to their export markets changing frequently.

- There are more than 100 car exporters in China (Ministry of Commerce of the People's Republic of China, 2013). They have no power in bargaining in the car carrier market because their industrial organisation has not been funded. Thus they cannot very often get stable slots even if they pay more than that of 20% higher freight rate than Japanese and South Korean exporters.

2.4.3.2 Global and domestic car carrier companies

On the other hand, China's car carrier companies are very weak in scale and experience although PCC is the dominant mode of car exports transportation.

- China’s car shipping markets are dominated by Japanese, South Korean and European shipping companies. It is hard for Chinese car exporters to obtain long-term stable services since they are not the key customers of global car carrier companies who have controlled all car exports shipping from China at present. They opened up shipping routes from the Far East to other regions to service their core customers of Japanese and South Korea automobile manufacturers. They only provide redundant spaces to Chinese car exporters after the vessel has been loaded in Japan and South Korea, which results in unstable schedules and space in Chinese ports. That is one of the significant reasons why many Chinese automobile manufacturers export completely knocked down (CKD) and semi-knocked down (SKD) units of vehicles and set up assembly plants abroad (CNSS, 2012).
- Chinese automobile manufacturers often suffered double discrimination of spaces and freight. The global car carrier companies require much higher freight rates from Chinese car exporters on the pretext of increased cost of a PCC calling Chinese ports.

- The global dominant car carrier companies have monopolized China’s car shipping market for long time to chase high profits.

The shortage of car carrier capacity and discrimination of freight rates seriously restricted the expansion of China’s car exports. China’s automotive industry and exports cannot achieve great development in the future without the support of China’s car carrier companies.

3 Analysis of the possibility and necessity of development of China's car carrier fleet

3.1 Global automotive industry

3.1.1 Global automobile production

The development of the automotive industry is one of the most significant symbols of industrialization in a country. The global automotive industry was used to concentrate in developed countries, such as North America, Western Europe, Japan and South Korea before globalizing manufacturing.

During the process of international industry transfer, global auto production patterns changed greatly. The output of the four traditional automobile manufacturing countries, the USA, Japan, Germany and France, shrank from 54.5% of the global output in 2000 (CAAM, 2010) to 32.23% in 2013 (CAAM, 2014) (See Appendix E, Appendix F).

Admitting that the distribution of the world's automotive industry is changing, the global automobile production has increased steadily, although there was a down turn in 2008 and 2009 due to the financial crisis. The total volume reached 87,300,155 cars in 2013 (CAAM, 2014). The average annual growth rate of global automobile output was 3.14% from 2000 to 2013 (CAAM, 2014) (See Appendix G).

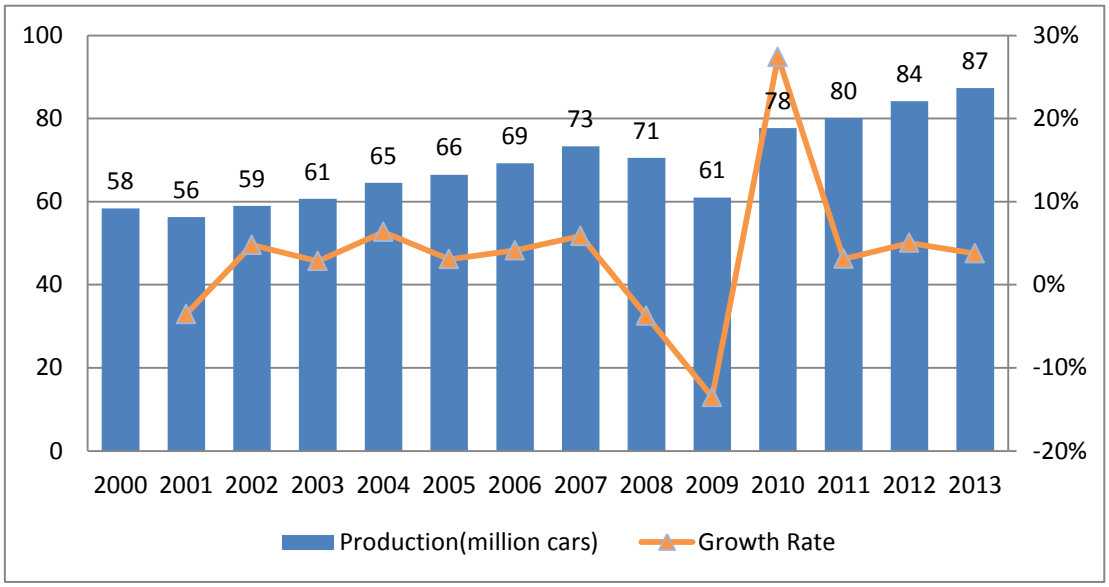


Figure 6 Global Automobile Production from 2000 to 2013

Source: (CAAM, 2014)

3.1.2 Changes in global automobile production distribution

The automotive industry was a glamorous business in industrialized countries in the last century. With the globalization of trade from the 1980s onwards, the global industry began to transfer from developed countries to developing countries, which geared up the booming of economies of major developing countries. The automobile assembly lines of the world's traditional automobile manufacturing countries began to be migrated to emerging countries proactively from the end of the last century when the per capita GDP of these countries gradually reached 3,000 U.S. dollars and the capacity of consumption sprung up accordingly.

Detroit, known as the automobile capital of the world, the former representative of the glory of the United States automotive industry declined and was declared bankrupt on December 3rd, 2013 (SOHU, 2013). The automobile production of the US was reduced from 12.80 million in 2000 to 5.73 million in 2009 (CAAM, 2014).

The popularity of and demand for automobiles in emerging markets continuously stimulated the development and innovation of the global automotive industry. The proportion of the production of the BRICS (Brazil, Russia, India, China, and South Africa) countries increased from 12.88% in 2002 to 37.18% in 2013. Meanwhile, the production decreased from 82.56% to 52.90% during the same period in North America, Europe, Japan and South Korea. With the migration of the global automotive industry and the industrialization in emerging countries, the BRICS automotive industry has a bright prospect in the future (OICA). To achieve new market shares, competition soon focused on the emerging markets across national borders from where the original car companies were located.

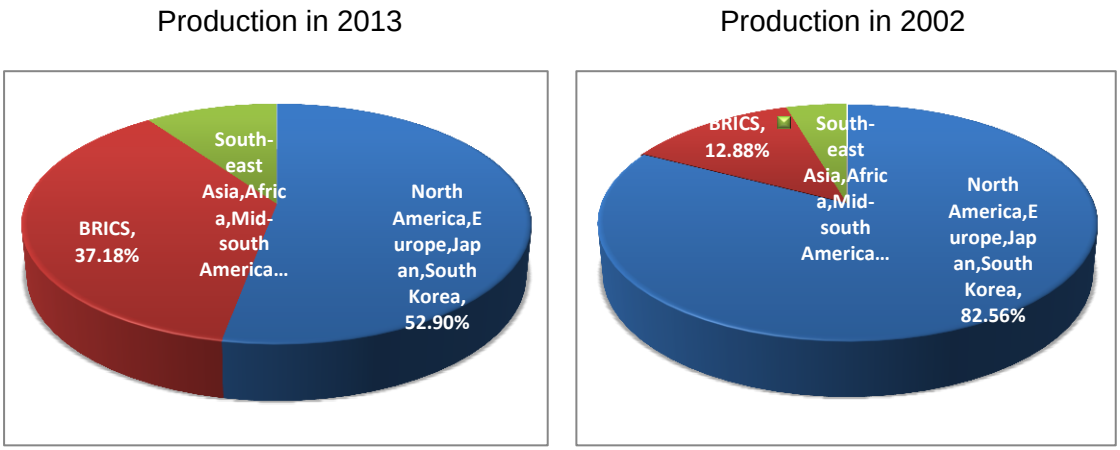


Figure 7 Global Automobile Production Distributions in 2002 and 2013

Source: (OICA)

As new industrialized countries usually have comparatively low-cost advantage, and in consideration of the prevalence of trade barriers, automobile companies tended to invest and operate transnationally in these areas rather than direct trade, which accelerated the scale and process of transnational investment and production transfer. The migration of the automotive industry, on the one hand enabled automobile manufacturers to take advantage of cheap local labour and resources to minimize production costs, on the other hand met the demand of emerging countries

for increasing employment, improving national output and taxes. The large-scale migration of the global automotive industry quickly developed under conditions of mutual benefit.

The top ten global automobile manufacturing countries in 2013 were China, the US, Japan, Germany, South Korea, India, Brazil, Mexico, Thailand and Canada. China's production was twice that of the USA who ranked second (GASGOO, 2014).

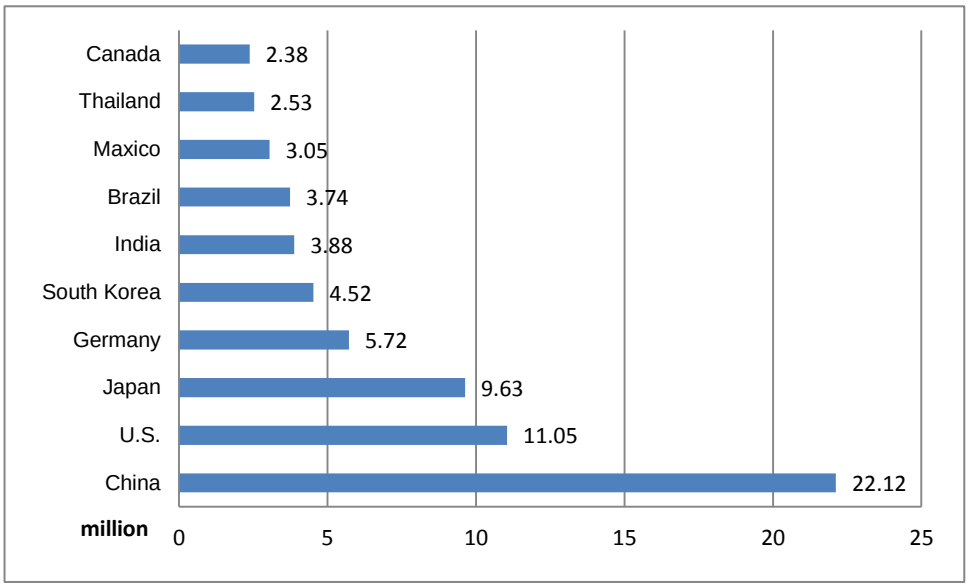


Figure 8 Top Ten Global Auto Manufacturing Countries in 2013

Source: (GASGOO, 2014)

The production of the above top ten automobile manufacturing countries accounted for 78.60% of the global output in 2013. Among them, five Asian countries (China, Japan, South Korea, India and Thailand) accounted for 48.89% while the South American countries (Brazil and Mexico) took 7.78% of the world's total output.

The fastest growth rate of automobile production was in China, followed by Brazil.

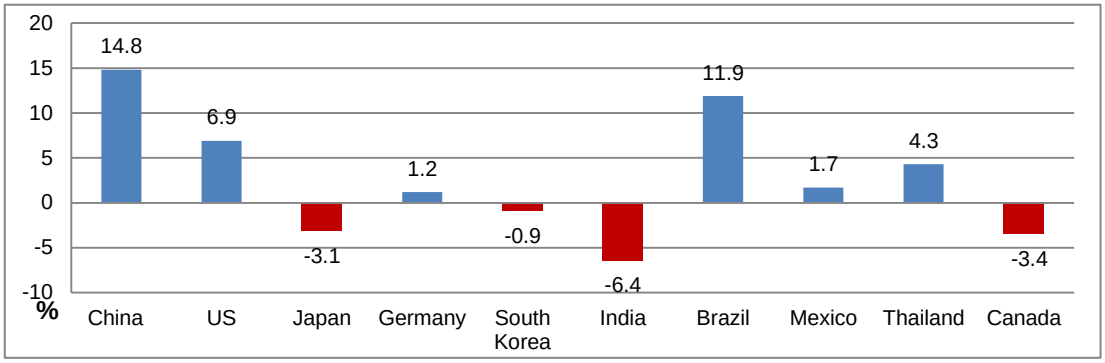


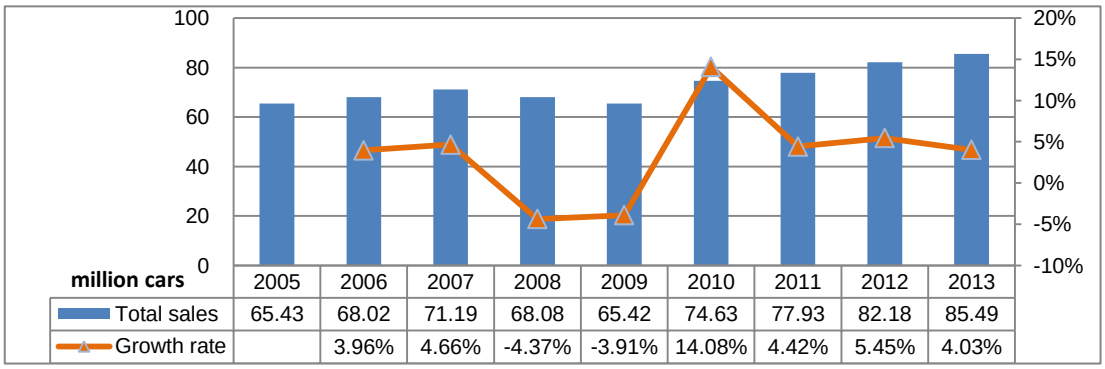
Figure 9 Growth Rate of Production of Top Ten Global Auto Manufacturing Countries in 2013

Source: (GASGOO, 2014)

3.1.3 Global automobile sales

Benefitting from the development of the global economy, especially the rapid economic recovery in developing countries and the US after the financial crisis, the automobile consumption made great progress and offset the sales slump in Europe, as a result of which the global automobile sales hit a new high.

The global automobile sales kept a similar growth trend as production. The average annual growth rate of global automobile sales was 3.40% from 2005 to 2013. In 2013, the global automobile sales were 85,488,553, an increase of 4.03% over the previous year (CAAM, 2014).



million cars	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total sales	65.43	68.02	71.19	68.08	65.42	74.63	77.93	82.18	85.49
Growth rate		3.96%	4.66%	-4.37%	-3.91%	14.08%	4.42%	5.45%	4.03%

Figure 10 Global Automobile Sales from 2005 to 2013

Source: (CAAM, 2014)

3.1.4 Changes in global automobile sales distribution

Since the late 1990s, the geographical distribution of automobile demand growth significantly shifted from the traditional markets of developed countries to the increasingly active emerging markets of newly industrialized countries, especially in Asia excluding Japan, Eastern Europe and South America.

Generally, when per capita GDP reaches 1000-2000 U.S. dollars in a country, an era comes for automobile consumption; when it reaches 3,000 U.S. dollars, the consumption will enter into a fast-growing period. According to the statistics of the World Bank, the per capita GDP of 126 out of the world's 186 countries and economies reached more than 3000 U.S. dollars in 2013 (The World Bank, 2014).

The process of popularity of cars in emerging industrialized countries appeared very similar to that at the early stage of the industrialization in developed countries. With the increase of per capita income and implementation of opening up policy, the automobile market gained rapid growth in these countries. In contrast, the market in traditional developed countries gradually became saturated and the growth of demand was relatively slow, mainly based on vehicle replacements.

The sales in Asia, Australia and the Middle East were most impressive with an average annual growth rate of 9.32% from 2005 and did not drop even during the period of financial crisis while the sales in Europe have been in long-term downturn. Sales in America were depressed during the financial crisis, but staged a recovery soon after 2009. Asia has gradually become the most important and exciting automobile consumption market. That is the reason why all the major automobile manufacturers focus on Asia as their target market to gain new revenue growth opportunities (CAAM, 2014) (See Appendix H).

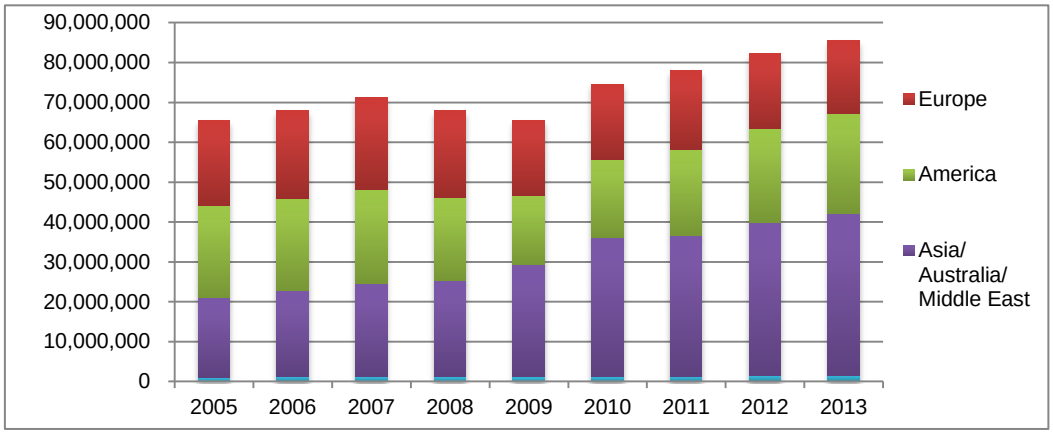


Figure 11 Global Automobile Sales Distributions between 2005 and 2013

Source: (CAAM, 2014)

Among the total global sales in 2013, sales in Europe accounted for 21.39%, in the American market 29.25% and in Asia, Australia and Middle East 47.43% of global auto sales. However, the sales of the three regions were relatively close to each other during 2005-2007 and America was the largest market during that period (CAAM, 2014).

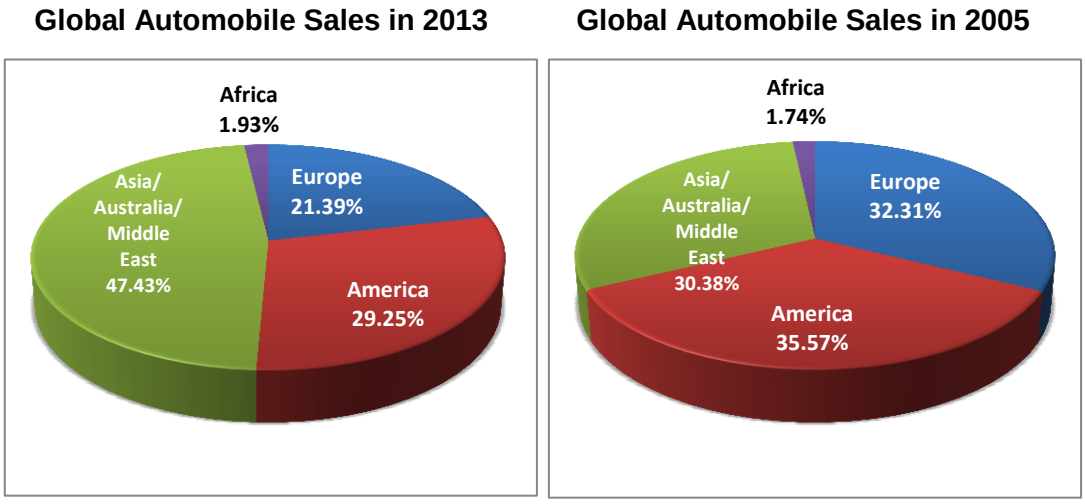


Figure 12 Global Auto Sales Distribution Comparison between 2013 and 2005

Source: (CAAM, 2014)

Compared to the high ratio of motorization in North America, the European Union (27), Australia, Japan and South Korea, the ratios in developing countries are relatively low. Just because of this, there will be large space for car sales increase in the emerging countries with the economic rejuvenation in these areas.

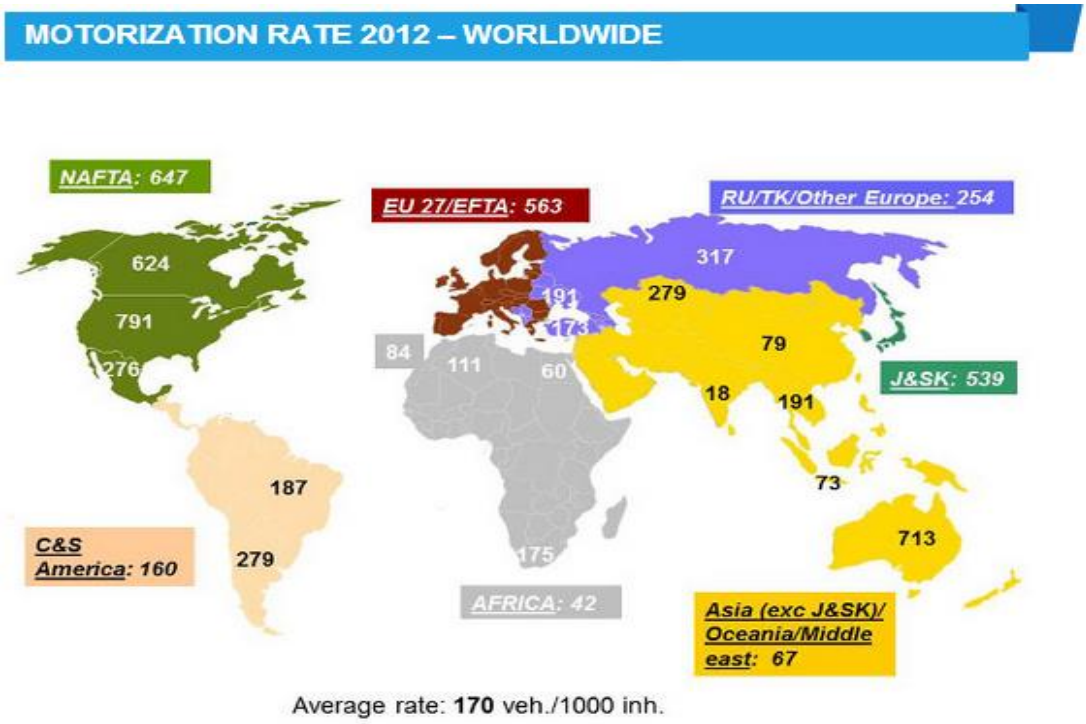


Figure 13 Motorization Rate – Worldwide

Source: (OICA)

3.1.5 The Value of Global Automotive Products Export

Global automobile exports have been the largest commodity trade in the world for a long time, basically accounting for about 9.5% of global merchandise trade annually before 2004. Then the proportion decreased slowly and has stood at 7% in recent years. The global automotive products exports value was 1,295,298 million U.S. Dollars in 2012 (WTO, 2014) (See Appendix I).

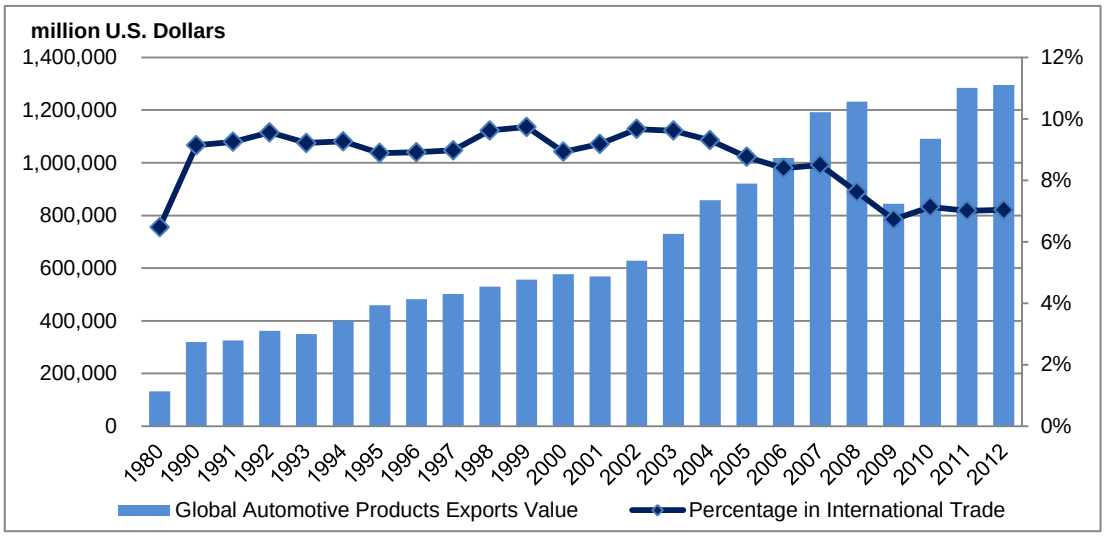


Figure 14 Values of Global Automotive Products Exports and the Proportion in Global Merchandise Trade

Source: (WTO, 2014)

Table 10 Automotive Products Exports and Imports Value of different Countries/Regions in 2012

Countries/Regions	Exports Value million USD	Countries/Regions	Imports Value million USD
Total	1,295,298.00	Total	1,317,931.00
European Union(27)	615,251.50	European Union(27)	438,727.50
Germany	234,765.30	United States	250,375.00
Japan	165,888.50	Germany	96,694.20
United States	132,246.00	China	73,972.60
Mexico	75,458.10	Canada	71,353.20
South Korea	72,005.10	United kingdom	58,773.00
Canada	62,151.30	France	52,952.00
France	49,874.90	Belgium	42,543.40
United Kingdom	47,385.80	Russian Federation	40,528.30

Spain	44,993.20	Mexico	39,437.20
China	43,109.58	Italy	30,881.20
Belgium	40,975.10	Australia	30,777.30
Italy	31,842.60	Spain	29,729.50
Czech Republic	28,515.30	Brazil	21,681.20
Thailand	24,276.20	Netherlands	21,263.40
Poland	23,327.40	Japan	20,440.00
Slovak Republic	19,937.30	Kingdom of Saudi Arabia	19,792.90

Source: (WTO, 2014)

The major automotive products export countries in Asia are Japan, South Korea and China; in Europe they are the European Union (27 member states); in North America they are the US, Mexico and Canada; in South and Central America they are Brazil and Agentina; and in Africa it is South Africa. Above all, the dominant export countries/regions in the world are the European Union (27), North America, Japan and South Korea (WTO, 2014).

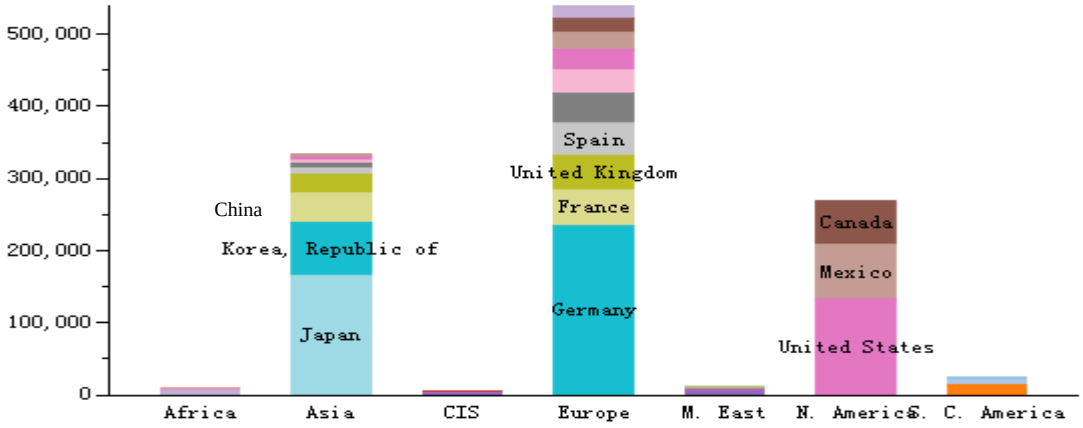


Figure 15 Automotive Products Exports Value of Major Trading Nations

Source: (WTO, 2014)

The major automotive products import countries in the Asian area are China, Australia and Japan. In CIS (Commonwealth of Independence States) it is the Russian Federation and in Europe the European Union (27). In the Middle East, it is the Kingdom of Saudic Arabia; in North America, they are the United Stares, Canada and Mexico; in South and Central America, they are Brazil and Agentina; and in Africa, they are Nigeria, South Africa and Algeria. On the whole, the most important automotive products import countries/regions are the European Union (27), the United Stares, Canada, China and Russia. In general, the export countries are more concentrated than the import countries (WTO, 2014).

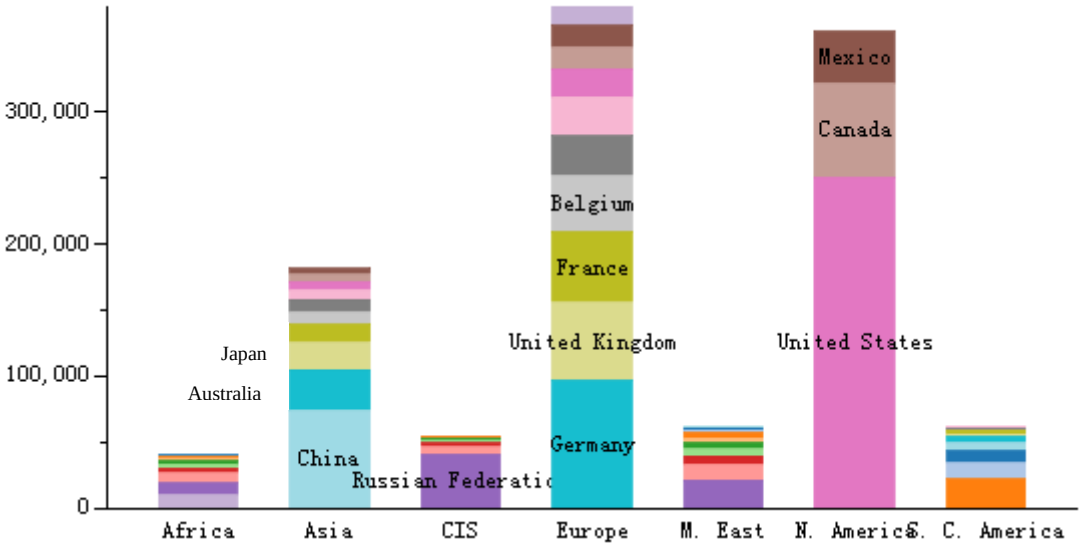


Figure 16 Automotive Products Imports Value of Major Trading Nations

Source: (WTO, 2014)

3.1.6 Changes in the global automotive industry

Development of the global automotive industry has always been accompanied by the global automobile group mergers and restructuring. The widespread global automobile production capacity surplus, in addition to increasingly stringent requirements for safety, emission control and energy conservation, has prompted the

global automotive industry to accelerate the pace of industrial restructuring significantly. Many automobile companies in developed countries enhanced their competitiveness through expansion, mergers and acquisitions. Globalization of the industrial chain and transnational large-scale restructuring radically changed the traditional resource allocation, competition patterns and organization structure of the automotive industry. By means of multinational acquisition, merger and equity holding, 10 top automotive groups have now been formed with output accounting for nearly 70% of the world's automobile production (OICA, 2013) (See Appendix J).

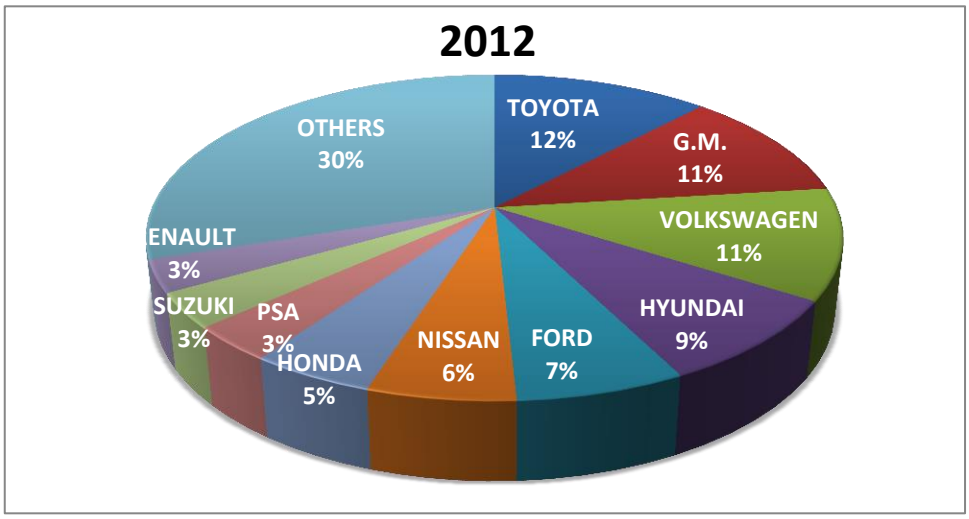


Figure 17 Proportion of Automobile Manufacturers Production in 2012

Source: (OICA, 2013)

As the automotive industry is a capital-intensive, technology-intensive, personnel-intensive, comprehensive and high economic benefit industry, it is impossible that every country can produce high-quality, high-tech advanced vehicles. The development of a country's automotive industry has close relationship with the level of its economy.

It is the uneven distribution of the global automotive industry and vehicle sales that promote the global automobile trade and shipping.

3.2 Global seaborne car trade

3.2.1 Volume of global seaborne car trade

Seaborne car trade has grown relatively strongly over a long-term, having increased by a compound average growth rate of 5.98% annually in the period 1996-2013. This growth caused total seaborne car trade to increase from 8.0m cars in 1996 to a record of 22.3m cars in 2007. Volumes were significantly affected by the global economic recession, with trade falling by 34% in 2009 to a total of 14.7m units. Since then, car trade has recovered somewhat and reached 21.46m cars in 2013 (Clarkson Research Services, 2014; Clarkson Research Services Limited, 2013) (See Appendix K).

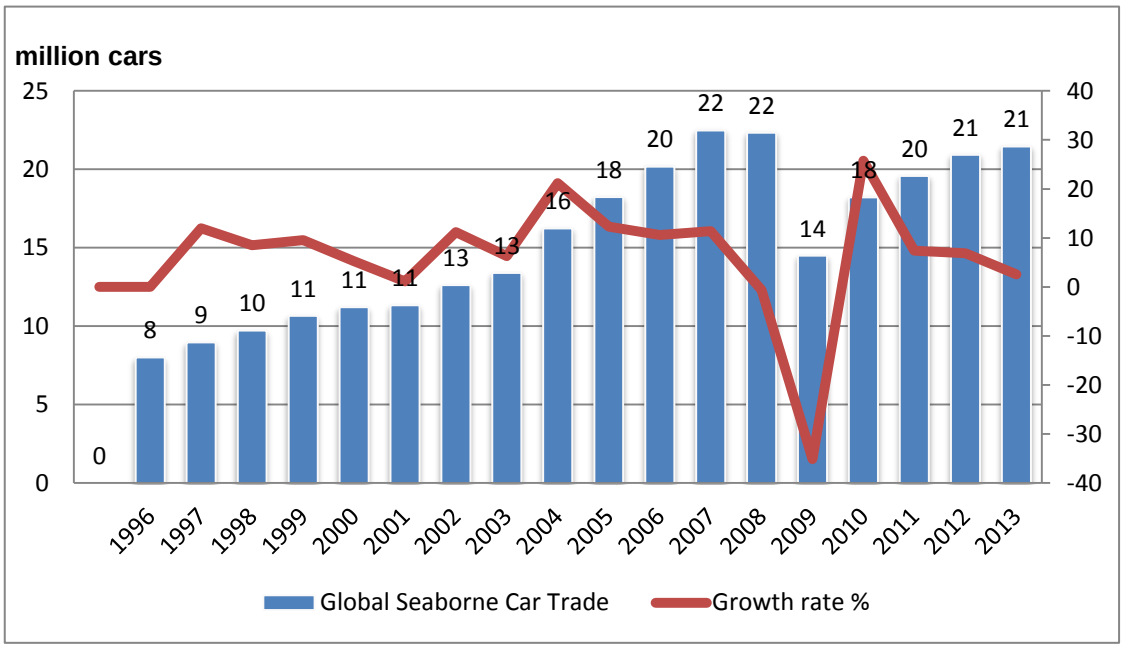


Figure 18 Global Seaborne Car Trade

Source: (Clarkson Research Services, 2014)

Compared to 3.40%, the average annual growth rate of global automobile sales from the year 2005 to 2013 and 3.14%, the average annual growth rate of global automobile output from 2000 to 2013, the 5.98% average growth rate of global

seaborne trade from year 1996 to 2013 is very high. However, the compound annual growth rate of global seaborne trade was 2.05% during the period 2005 to 2013, which means that the seaborne car trade was affected more seriously than production by the financial crisis.

Table 11 Growth rate of Global Automobile production, Sales and Seaborne Trade

	Growth Rate in 2005-2013	Growth Rate in Different Period	
Production	3.46%	2000-2013	3.14%
Sales	3.40%	2005-2013	3.40%
Seaborne Trade	2.05%	1996-2013	5.98%

Source: (CAAM, 2014; Clarkson Research Services, 2014)

Table 12 The Proportion of Global Seaborne Car Trade to Sales

Year	Seaborne Car Trade million cars	Global Total sales million cars	Trade/Sales %
2005	18.24	65.43	27.88%
2006	20.17	68.02	29.65%
2007	22.47	71.19	31.56%
2008	22.33	68.08	32.80%
2009	14.49	65.42	22.15%
2010	18.22	74.63	24.41%
2011	19.57	77.93	25.11%
2012	20.92	81.74	25.59%
2013	21.46	85.39	25.13%

Source: (CAAM, 2014; Clarkson Research Services, 2014)

The seaborne car trade accounted for about one fourth of the global auto sales in the recent four years while the ratio was around 30% before the economic recession. The exports were restrained due to the global financial crisis. The effect of the economic recession to global seaborne car trade is obvious.

3.2.2 Main seaborne car trade shipping routes

The major car carrier shipping routes are from Asia to the EU, from Asia to North America and from the EU to North America.The largest seaborne car trade routes are from Asia to the EU and North America (Clarkson Research Services Limited, 2013) (See Appendix L, Appendix M).

3.2.2.1 Seaborne car exports

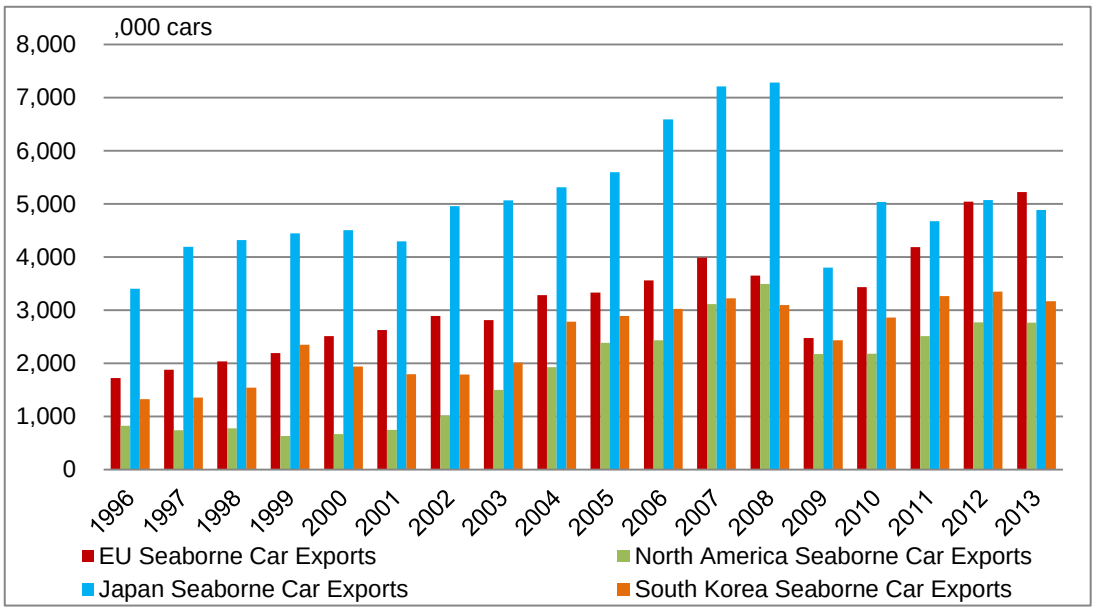


Figure 19 Global Major Seaborne Car Exports

Source: (Clarkson Research Services, 2014)

Japan and South Korea are the leading seaborne car exporters. Japan, South Korea, the EU and North America have always dominated the global seaborne car exports. The volume of the four areas accounted for 90.25% of global seaborne car exports in

1999 while Japan and South Korea together accounted for 63.73% at that time. Afterwards, the proportion of Japan has kept a decreasing trend from 41.7% in 1999 to 22.76% in 2013, but the proportion of South Korea, the EU and North America did not fluctuate very much in the same period. The EU's seaborne exports have presented a slight increase in recent years. However, the above areas' seaborne car exports still reached 74.76% in 2013, among which Japan and South Korea accounted for 37.52%, the EU, North America for 37.24% respectively (Clarkson Research Services, 2014) (See Appendix N).

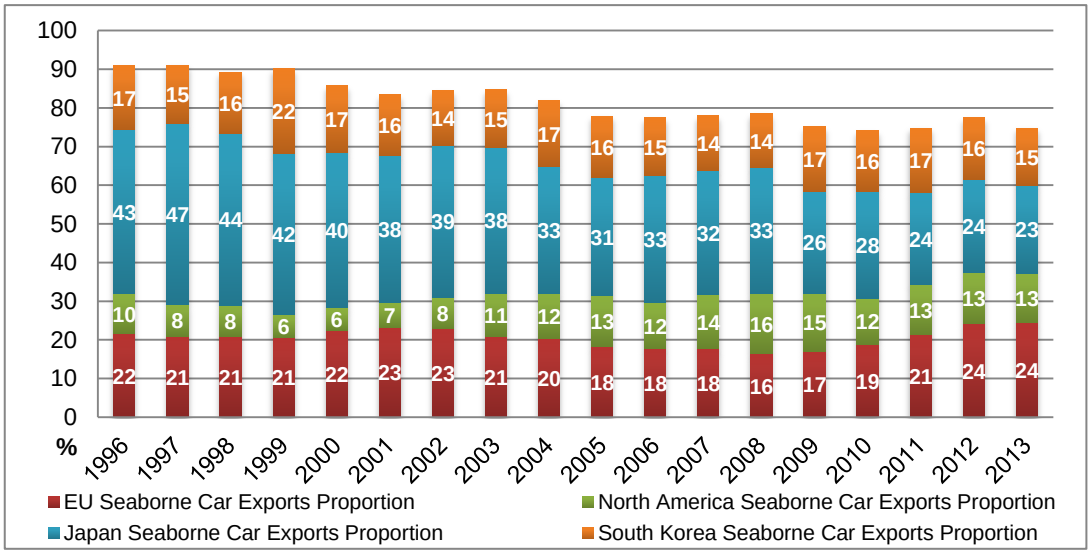


Figure 20 Proportion of Global Major Seaborne Car Export Areas

Source: (Clarkson Research Services, 2014)

Japan is a major supplier to the US and accounted for over 50% of US seaborne imports in 2010. Around 25% of South Korea's exports are shipped to North American countries, primarily to the US. Imports from Japan and South Korea are expected to account for around 70% of their imports, a proportion that has remained surprisingly steady over the last decade despite the recent strong growth in exports from other suppliers such as China (Clarkson Research Services, 2012). The share of Japanese and South Korean cars in the EU seaborne imports has fallen in recent

years, from 48% in 2007 to 38% in 2012 due to a rapid rise of Indian exports to the EU, whose share increased from 4% in 2007 to 10% in 2011 (Clarkson Research Services Limited, 2013).

Seaborne car exports from Europe (based on EU-28 external trade) have grown rapidly from 2.48m cars in 2009 to 5.22m cars in 2013 and have overtaken those of Japan in 2013. The rapid expansion in shipments to China has been one driver of this growth as Chinese demand for European-made cars has risen. The exports to the US have also proven strong. The US itself is also a significant car exporter, and shipped 1.9m cars in 2012, accounting for 9% of total seaborne car trade (Clarkson Research Services Limited, 2013).

Since car exporters have diversified to a lesser degree than importers, increased shipments from developing countries, including China, India, Thailand, Turkey and Brazil, have displayed strong growth in recent years. These trends are likely to continue in the coming years, and as a result the outlook for global car trade is positive.

3.2.2.2 Seaborne car imports

Europe and North America are significant both exporters and importers of cars by sea and accounted for 57% of imports in 2003. However, this proportion has declined relatively steeply in recent years to stand at about 30% in 2013. The major suppliers of the US and the EU car imports are Japan and South Korea as analysed above. The US and the EU are also major suppliers of car imports to each other. Overall, trade on routes from Japan and South Korea to North America and Europe was estimated to have accounted for 38% of global trade in 2003, and just 17% in 2012 as trade routes have diversified further (Clarkson Research Services Limited, 2013) (See Appendix O).

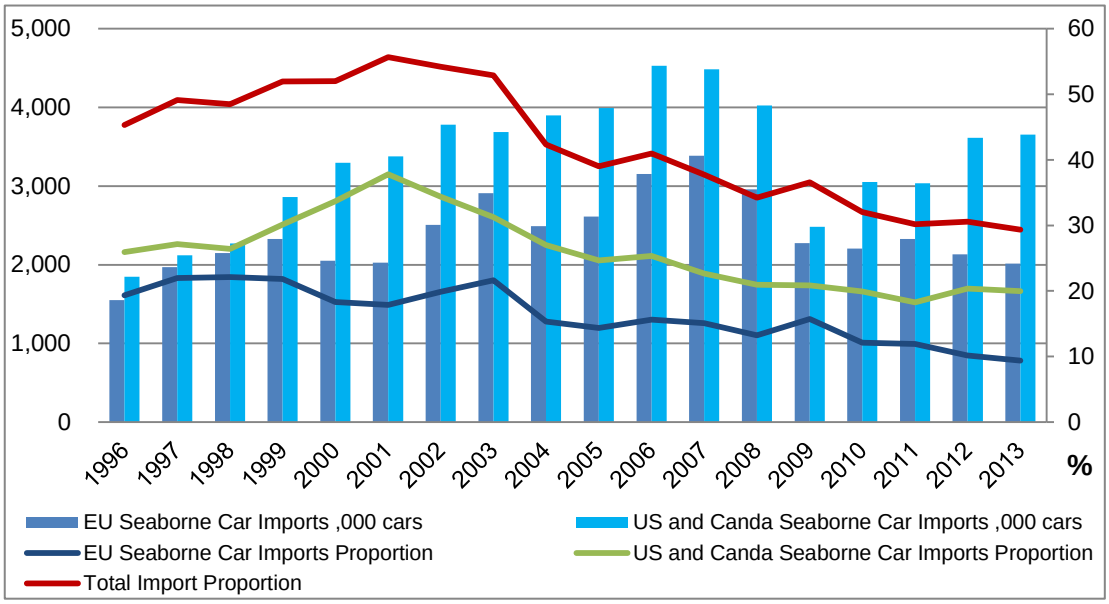


Figure 21 EU and North American Seaborne Car Import Volumes and Proportion

Source: (Clarkson Research Services, 2014)

Car imports to the US have always been larger than those to the EU (based on EU-28 external trade). The US imports accounted for an average of 20% of total seborne car trade between 2003 and 2012. Trends in the US demand have a significant impact on global car trade volumes. Between 2003 and 2006, the US seaborne car imports rose by 23% and reach 4.49m cars in 2006. After declining slightly in 2007 and 2008, US seaborne car imports crashed in 2009 by 39% to 2.48m cars due to the global financial crisis, but quickly recovered by an increase of 23% to 3.05m cars in 2010 (Clarkson Research Services Limited, 2013). Then the trend is continuing until now and the volume reached 3.65m cars in 2013, which accounted for around 17% of total seaborne car trade.

European seaborne car imports have grown less significantly than the US over the last decade. The EU-28 imports generally kept an increasing trend before the financial crisis, but the trend turned down from 2008 and it seems that there are no

signs of recovery in the short term due to economic difficulties and the sovereign debt crisis in the region (Clarkson Research Services Limited, 2013).

As North American and European imports have slowed down in recent years, the share of other importers has increased firmly, from 42% in 2003 to 67% in 2012 in global seaborne car trade (Clarkson Research Services Limited, 2013).

The growth of economic and consumption capacity has been the driver of rapidly rising demand for cars in a number of developing countries. Chinese and South American imports have grown strongly in recent years. Chinese imports kept increasing even during the financial crisis and have nearly tripled since 2007 to reach 1.06m cars in 2013. Combined Brazilian and Argentinian seaborne imports have also grown firmly, having risen by 53% between 2008 and 2013 to stand at 1.18m cars. Elsewhere, Turkish imports rose by 79% between 2008 and 2012, while Colombian imports grew by 75% over the same period (Clarkson Research Services Limited, 2013).

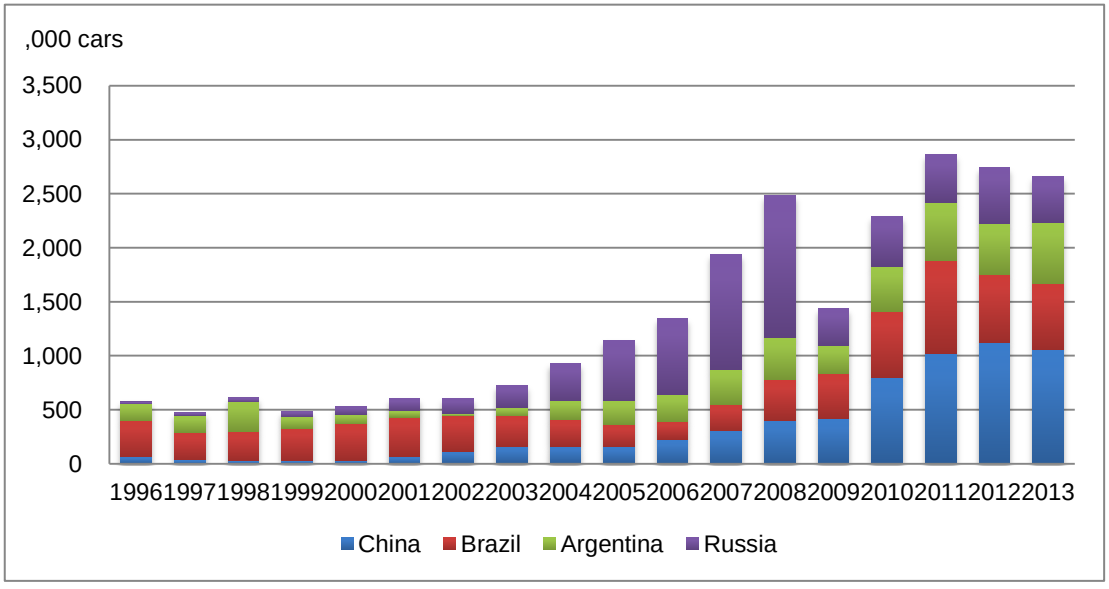


Figure 22 Seaborne Car Import in Some Emerging Countries

Source: (Clarkson Research Services, 2014)

3.3 Experience of Japanese and South Korean automotive industry development

3.3.1 Japan's experience in automotive industry internationalization

3.3.1.1 Development of Japanese car exports

Japan's automotive industry gained rapid expansion after the World War II with the government's active support. Japanese cars began to be exported in the late 1960s and the exports increased quickly after entering the 1970s. The car exports were 1.08m in 1970 and reached 5.96m in 1980. The exports kept very high level after entering the 21st century, but declined after the financial crisis in 2008 (DRCSC, SAE of China, Volkswagen Group China, 2013).

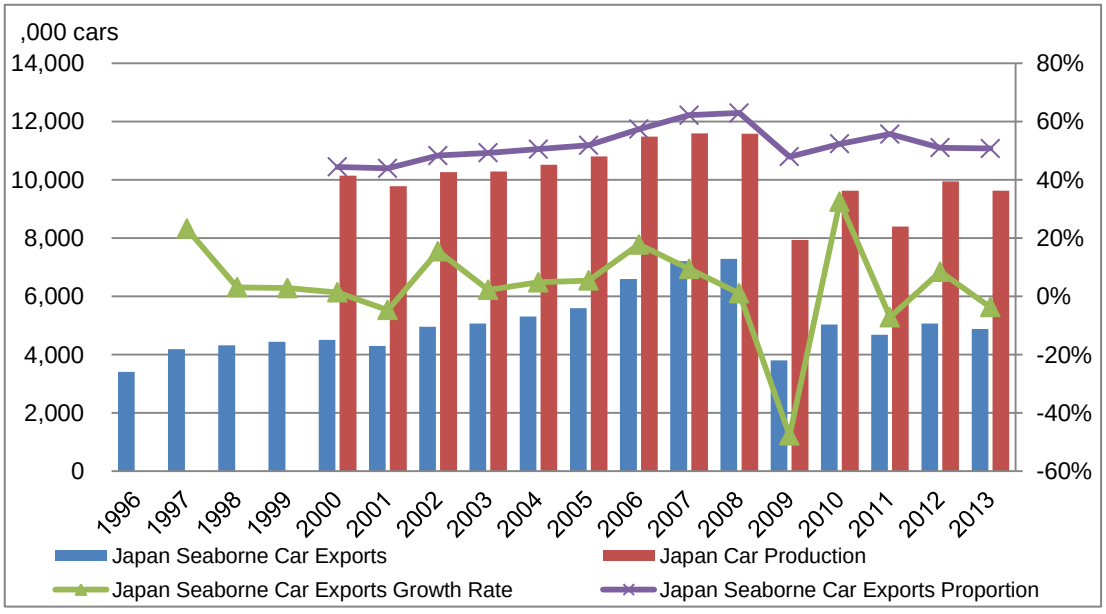


Figure 23 Japan Car Production and Seaborne Car Exports

Source: (CAAM, 2014; Clarkson Research Services, 2014)

Since Japan is an island country, the car export transportation is basically by ro-ro vessels. From the long-term of large volume of exports point of view, Japan is a very successful country in internationalization of its automotive industry. About 50% of the

production was exported (CAAM, 2014; Clarkson Research Services, 2014). Moreover, most Japanese cars are exported to developed counties and take a large market share by cooperating between the manufacturers, the government and industrial associations, which promote sustainable development of Japan's automotive industry (DRCSC, SAE of China, Volkswagen Group China, 2013).

3.3.1.2 Reasons for Japanese car exports being prosperous

Firstly, Japan attached great importance to market analysis and preparation before introducing new products to meet the needs of markets. Japanese automobile manufacturers launched fuel-efficient small cars timely during the period of the oil crisis and quickly established their position in the US. They focused on training of international personnel in the early stages of overseas expansion in order to ensure product quality. They have always paid great attention to automobile quality and established a sound service system when they entered the overseas markets.

Secondly, the Japanese government provided sufficient support to the automotive industry for internationalization. The government supported the domestic automotive industry by providing not only strategic guidance, but also specific measures. The measures included the following:

- The tariff and non-tariff measures;
- The permit system for car exports to strengthen the management of the exporter;
- Capital support for local enterprises' overseas development;
- Overseas Investment Insurance System and Overseas Investment Losses Reserve System established and other specific measures to protect the investment;
- Financial assistance, financial subsidies and tax reductions and other positive policies provided by the Japanese government in the early stages of introduction

of technology to the automotive industry to improve its competitiveness, and further strengthened support in the stage of technology upgrade.

- In the meantime, the stable currency exchange rate maintained by the government to provide the opportunity to promote the competitiveness of Japanese cars.

Furthermore, the industrial association played an important role in coordination of the domestic and overseas public relations and in domestic enterprises' overseas services (DRCSC, SAE of China, Volkswagen Group China, 2013).

3.3.2 South Korea's experience in the automotive industry internationalization

3.3.2.1 The problems confronted by the South Korean automotive industry in the process of internationalization

The South Korean government put forward the "export first" policy for implementation of an export-oriented development strategy in the 1960s. The South Korean government believed in the automotive industry's prospects and classified the automotive industry as one of the top ten strategic industries, giving special privileges in taxes, loans, insurance, finance and other aspects. At the same time, South Korea established technology partnerships with automobile and components factories in the US, Japan, France and other developed countries. The vehicle performance and self-sufficiency rate of components were improved continuously. The car exports increased year by year. Like Japan, South Korea's car exports are transported basically by ro-ro vessels too. South Korean seaborne car exports reached more than 1 million cars in 1995. However, the global market began to doubt the performance of South Korean cars due to the core technology and quality problems, which led to South Korean car sales being depressed in the international market. Hyundai Motor realized the substance of the issue and set up "quality first"

production standards. The Korean automobile manufacturing level quickly improved and regained recognition in the global market thereafter (DRCSC, SAE of China, Volkswagen Group China, 2013). About 70% of production was exported. The exports have been stable in recent years and the seaborne car exports were 3.17 million in 2013 (CAAM, 2014; Clarkson Research Services, 2014).

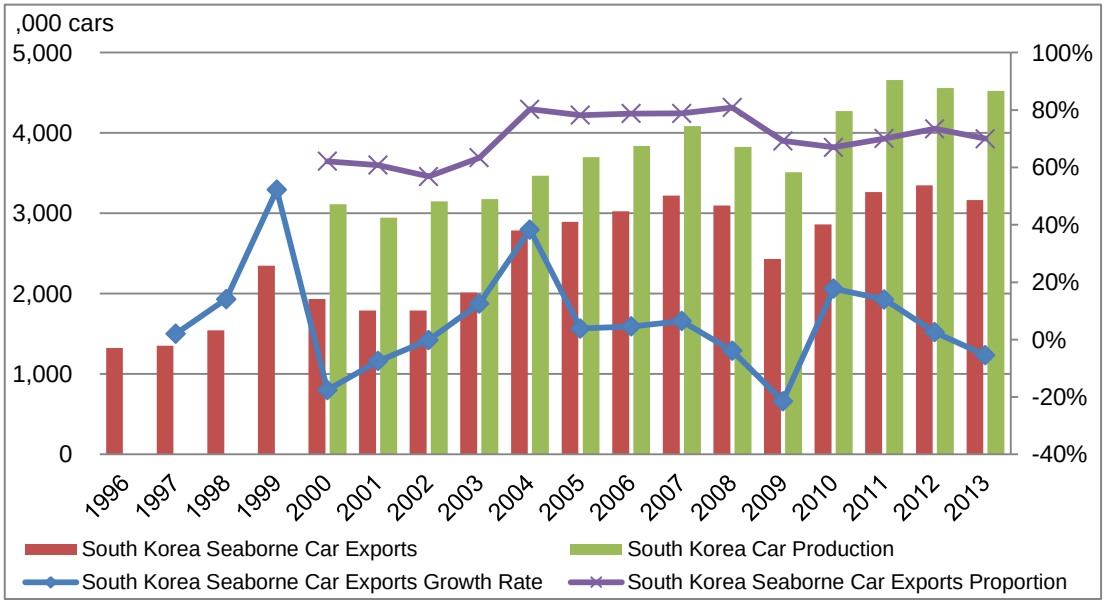


Figure 24 South Korea Car Production and Seaborne Car Exports

Source: (CAAM, 2014; Clarkson Research Services, 2014)

3.3.2.2 Reasons for South Korean car exports being prosperous

The South Korean government played a significant role in the process of internationalization of Korean cars. They provided measures to protect the local automotive industry by protecting the domestic car market. In the initial stage, the Korean government implemented high import tariffs and non-tariff barriers to curb car imports, in order to create favorable conditions for Korean manufacturers to enhance their own ability.

The government actively and steadily developed national car development plans. In the early 1990s, the government made middle and long term development plans for the automotive industry.

- In the first stage, to expand productivity and establish exports foundation (mainly for sedan exports);
- In the second stage, to improve product quality and further expand exports (the type of export vehicle extended to commercial vehicles);
- In the third stage, to promote internationalization and make the automotive industry become a leading industry earning foreign exchange through exports.

The South Korean government assisted R&D with immense capital to enhance the technological strength of automobile enterprises. The government supported the acquisition and merging of components enterprises and actively attracted advanced foreign components enterprises to found factories in South Korea.

The export-oriented strategy was first proposed by the government in 1973. Then lots of policies followed to adhere to it. Many leading finished automobile and components enterprises came into being in a short period of time with the help of the Government, for example Hyundai Motor (DRCSC, SAE of China, Volkswagen Group China, 2013).

3.4 Global pure car carrier (PCC) fleet

3.4.1 PCC fleet impacted by the financial crisis

The automotive industry was terribly impacted by the global financial crisis in September 2008 for the short term. The car freight rate collapsed suddenly. For example, the freight rate was 130USD/m^3 for high vehicles and 70USD/m^3 for cars from China to the Mediterranean and North Africa before September 2008, but fell to depressed levels of 40USD/ m^3 and 30USD/ m^3 respectively thereafter.

To cope with the common global economic disaster, car carrier companies decided to coordinate with each other in the following ways.

- Lay up excess capacity. About 45% of the capacity was laid up in the first half of 2009;
- Scrap old ships. 17% of the total capacity was demolished in 2009 and 2010;
- Delay the delivery of new vessels.

With the gradual increase of global seaborne car trade after the crisis, car carrier companies began to release capacity. The global automotive industry quickly recovered and became one of the best maritime sub-sectors under the overall effective control of capacity (CSCC, 2014).

3.4.2 PCC fleet

Growth of the PCC fleet was comparetively strong in the past, especially during the period between the start of 2004 and the start of 2009 with the PCC fleet capacity rising 60% to a total of 3.1million ceu. The number of PCC vessels and capacity have kept an increasing trend, although the whole maritime industry was seriously struck by the financial crisis. The fleet of car carriers in the 4,000-5,999 and more than 6,000 vehicle capacity sectors continues to experience spectacular growth, while car carriers in the 2,000-3,999 and less capacity sectors evidenced an obvious trend of decrease. The reason is the need for larger size vessels. Vessels with a capacity of more than 4000ceu are generally utilized on the main deep sea, higher volume trades, those of 2000-3000ceu are generally utilized in deep sea trades, but also used in short sea trades, and those of less than 2000ceu are usually served in short sea car trades. At the start of 2014, the global fleet of PCCs totalled 756 vessels with a combined capacity of 3.66 million ceu (Clarkson Research Services Limited, 2013; Clarkson Research Services, 2014) (See Appendix P).

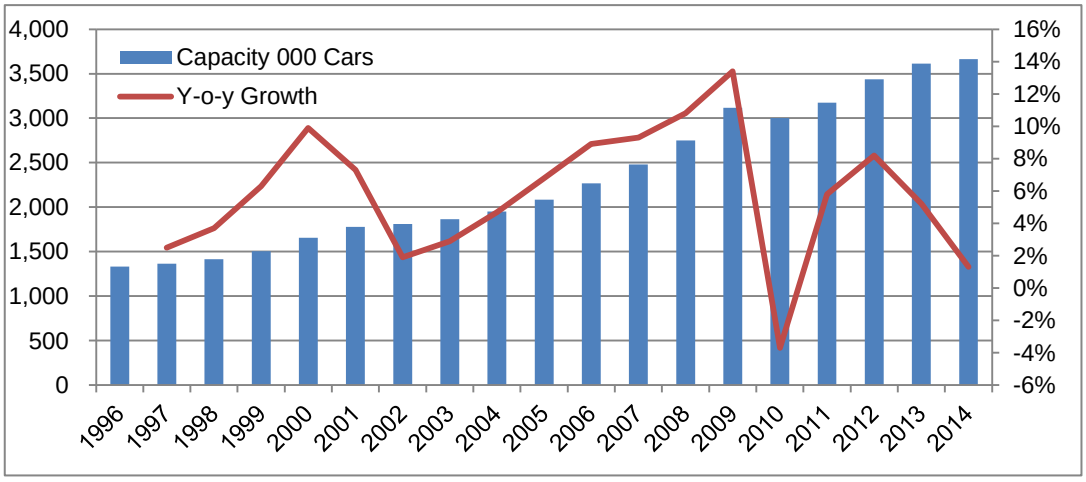


Figure 25 PCC Fleet Development

Source: (Clarkson Research Services Limited, 2013)

At the start of July 2014, the global PCC fleet totalled 767 vessels with a combined capacity of 3.74m ceu. 42.8% of the fleet were 6,000+ceu PCCs, with an average age of 4.4 years, accounting for 2.17m ceu, equivalent to 57.9% of total fleet capacity (Clarkson Research Services, 2014) (See Appendix Q).

Table 13 PCC Fleet Capacity in 2013

Type of Vessel	No. of Vessel	Capacity (CEU)	% of Fleet Number	% of Fleet Capacity	Average Age
<1,000	61	38,961	8.0%	1.0%	**18.7**
1,000-2,999	77	137,646	10.0%	3.7%	**16.3**
3,000-3,999	63	224,376	8.2%	6.0%	**18.0**
4,000-4,999	125	566,828	16.3%	15.2%	**16.0**
5,000-5,999	113	606,600	14.7%	16.2%	**14.4**
6,000 & Over	328	2,167,470	42.8%	57.9%	**4.4**
Total	767	3,740,881	100%	100%	**14.7**

Source: (Clarkson Research Services, 2014)

In the current fleet, the first 6000+ceu vessel was delivered in 1987. The number of this large type of vessel began to grow substantially from 2003 and it has become the dominant type of PCC now. The proportion of car capacity also rises accordingly with the demolishing of old small vessels.

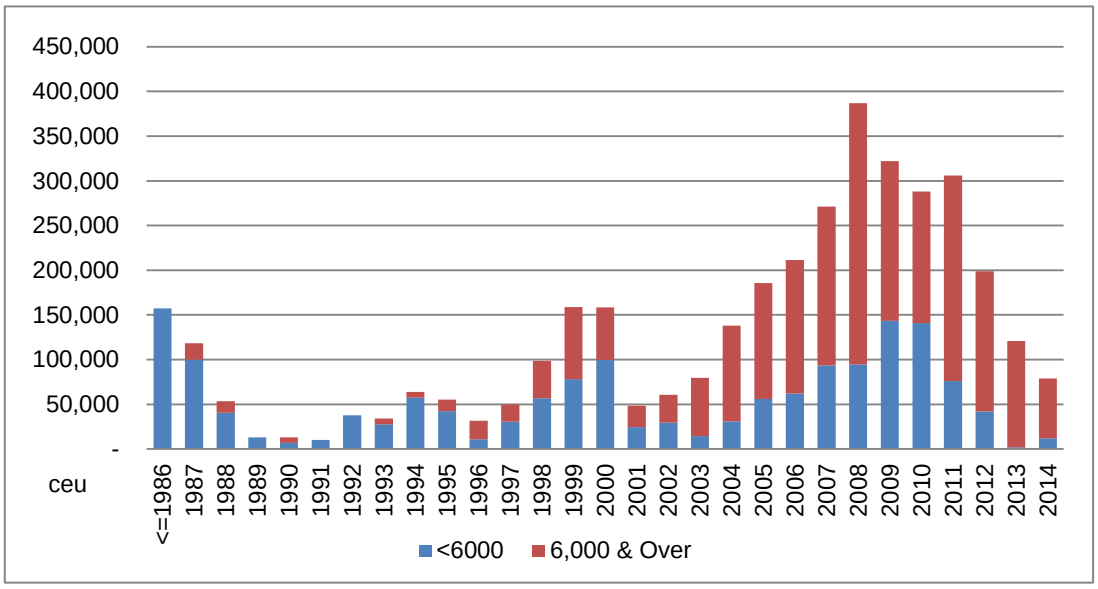


Figure 26 Current PCC Fleet by Year of Delivery in Capacity

Source: (Clarkson Research Service, 2014)

3.4.3 Orderbook

The PCC orderbook increased in scale by a compound average growth rate of 52.84% per annum, from 102,304ceu at the start of 2002 to 1,304,261ceu at the start of 2008. During this period, the seaborne car trade was growing relatively firmly. Since then, the orderbook has declined largely due to the the global financial crisis. At the start of 2013, the orderbook had fallen to 284,372ceu, with a compound average annual decrease of 26.26% since the start of 2008. At the start of 2014, the capacity of the orderbook was 488,909ceu, an increase of 71.92% over the last year (Clarkson Research Services, 2014).

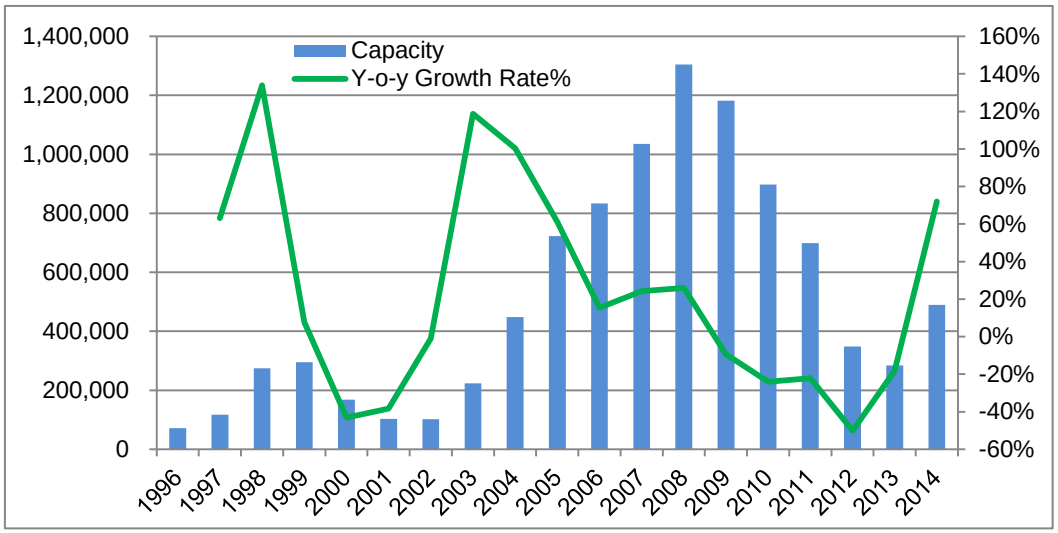


Figure 27 PCC Orderbook Development

Source: (Clarkson Research Services, 2014)

There have been 15 new vessels delivered in 2014 before July and 13 of them are 6000+ vessels.There are still 69 PCCs which will be delivered in the next four years.

Table 14 PCC Orderbook Delivery at start of July 2014

Year	<1,000		1,000-2,999		3,000-3,999		5,000-5,999		6,000&Over		Total	
	No.	Cars	No.	Cars	No.	Cars	No.	Cars	No.	Cars	No.	**Cars**
2014	2	1225							10	69,030	12	**69,955**
2015							1	5500	31	226,330	32	**231,830**
2016			2	4000	2	7600			13	159,560	17	**171,160**
2017									8	58,400	8	**58,400**
Total	2	1225	2	4000	2	7600	1	5500	62	513,020	69	**531,345**
%	2.90	0.23	2.90	0.75	2.90	1.43	1.45	1.04	89.86	96.55		

Source: (Clarkson Research Services, 2014)

Among the orderbook, 62 of them are more than 6,200ceu accounting for 96.55% of the total capacity on order, 43 of them have a capacity of over 7,000ceu, and 10 have a capacity of over 8000ceu. The largest sizes on order have a capacity of 8,500ceu

and the order number is 6. It is obvious that vessels of 6000+ ceu have become the main type of PCC to gain ecomomy of scale.

3.4.4 Demolition

PCC demolitions have been very weak over most of the last couple of decades, However, the global financial crisis had a dramatic impact on the PCC sector. In 2009, 111 vessels with a total capacity of 430,000 cars were demolished, equivalent to 14% of the fleet at the start of 2009 (Liu, 2014).

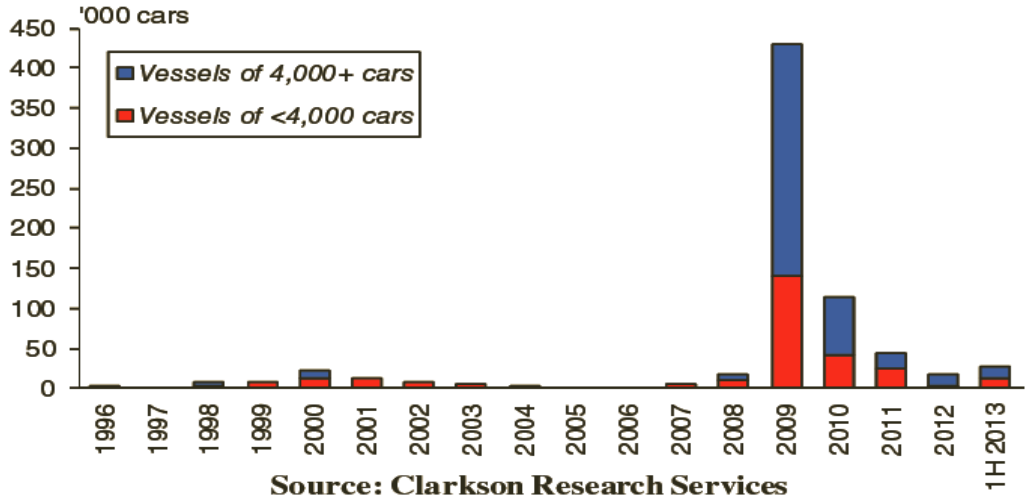


Figure 28 PCC Demolition

Source: (Clarkson Research Services Limited, 2013)

3.4.5 Global car carrier supply and demand

The demand for car carriers (based on global seaborne car trade volume) generally fluctuated much more than the supply (based on global PCC fleet capacity). However, in the long term point of view, the compound annual growth rate is almost the same from 1998 to 2013; for global PCC fleet capacity it was 5.98% and for global seaborne car trade it was 5.97%.

At the start of 2001 the supply/demand ratio was 15.98% and the ratio kept on deceasing to 12.23% until the start of 2008. Then with the vigorous growth of the orderbook and delivery of new large vessels, the supply/demand ratio rapidly reached 20.71% at the start of 2010. The surplus of supply was very serious which led to very low time charter rate in the car carrier market from 2009. Afterwards, the growth of seaborne car trade was somewhat faster than fleet capacity and the ratio slowly declined to about 17% at the start of 2014. Overall, the ratio is higher than that before the financial crisis (See Appendix R).

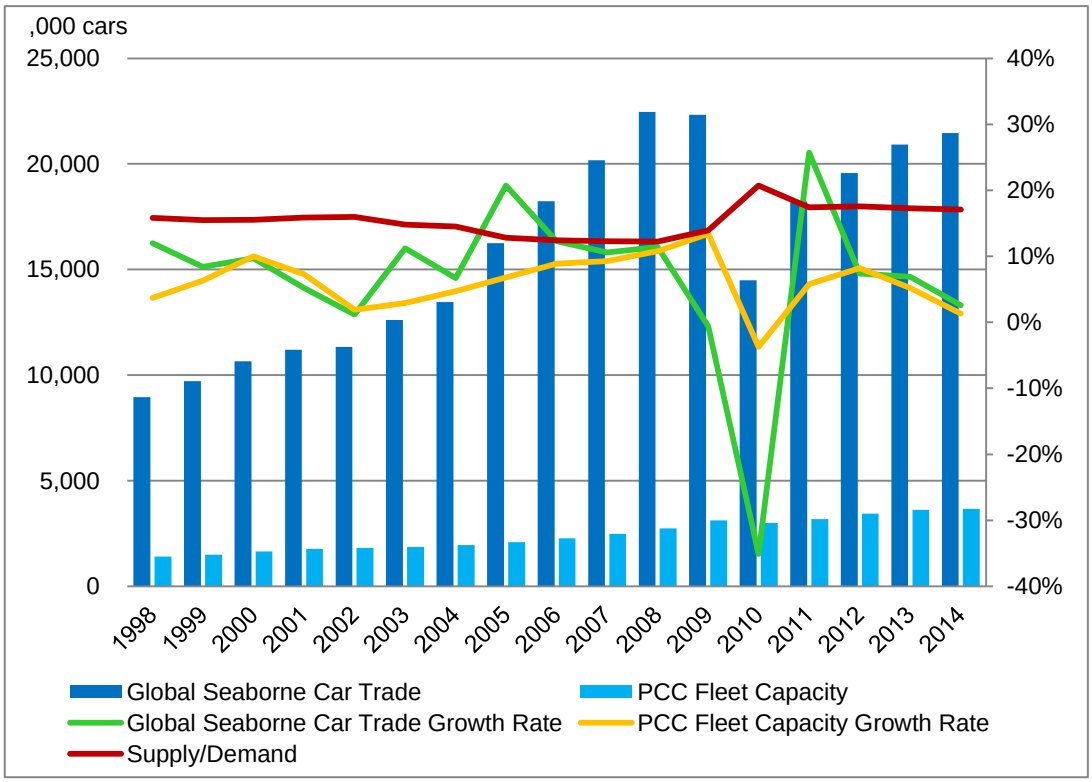


Figure 29 Global car carrier supply and demand

Source: (Clarkson Research Services Limited, 2013; Clarkson Research Services, 2014)

3.4.6 Major car carrier operators

3.4.6.1 Major car carrier owners and capacity

Table 15 Top 20 PCC Owner Fleets Capacity at Start of July 2014

	Owner	<2000		2000-3999		4000-5999		6000+		Total		Average	Country
1	Nippon Yusen Kaisha	1	709	4	14323	31	161043	35	223468	71	399543	5627	Japan
2	Mitsui O.S.K. Lines	1	1454	6	21918	17	85404	40	255028	64	363804	5684	Japan
3	K-Line	6	6957	6	21860	20	95884	26	160485	58	285186	4917	Japan
4	Ray Shipping	1	1600	6	16150	7	34550	34	225513	48	277813	5788	Israel
5	Cido Shipping	0	0	8	24009	12	54209	22	141332	42	219550	5227	Hong Kong
6	Leif Hoegh & Co.	0	0	2	5012	16	75158	18	128763	36	208933	5804	Norway
7	Wallenius Lines AB	0	0	4	12385	9	49924	17	126377	30	188686	6290	Sweden
8	Eukor Car Carriers	0	0	0	0	1	5450	22	163746	23	169196	7356	South Korea
9	WW Holding	0	0	0	0	5	25698	20	134560	25	160258	6410	Norway
10	Hyundai Glovis	0	0	0	0	3	12937	18	118980	21	131917	6282	South Korea
11	Shoei Kisen K.K.	0	0	2	6238	1	5221	13	82269	16	93728	5858	Japan
12	Gram P.D.	5	5660	5	14578	6	25187	2	13000	18	58425	3246	Norway
13	NOCC	0	0	0	0	7	32012	4	25804	11	57816	5256	Norway
14	Toyofuji Shipping	6	8103	5	10066	2	9323	4	24393	17	51885	3052	Japan
15	Zodiac Maritime Agy.	0	0	0	0	8	38371	2	12679	10	51050	5105	UK
16	Toa Shipping	0	0	0	0	2	9310	6	39012	8	48322	6040	Japan
17	Grimaldi Group	0	0	0	0	10	47002	0	0	10	47002	4700	Italy
18	Internat. Shipholdg.	0	0	0	0	3	15183	4	24742	7	39925	5704	US
19	F. Laeisz	0	0	0	0	8	39200	0	0	8	39200	4900	Germany
20	Fukunaga Kaiun	0	0	0	0	6	29307	1	6015	7	35322	5046	Japan
	Others	84	75349	49	154612	64	322055	40	261301	237	813317		
	Total	104	99832	97	301151	238	1172428	328	2167467	767	3740878		

Source: (Clarkson Research Services, 2014)

The ownership of the PCC fleet is relatively consolidated. The top ten owners are responsible for 64.29% and the top 20 account for 78.26% of the total vehicle capacity of the global fleet (Clarkson Research Services, 2014).

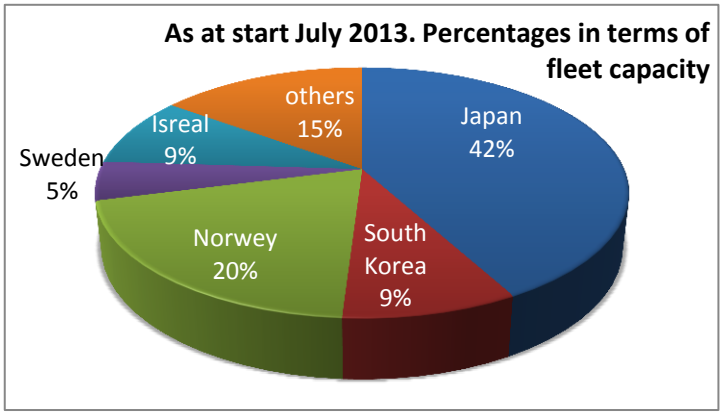


Figure 30 PCC Fleet by Owner Countries

Source: (Clarkson Research Services Limited, 2013)

Japan is the leader of automobile exports with Japanese owners responsible for 42% of capacity at the start of July 2013. Japanese and South Korean owners hold more than 50% of the global fleet capacity while Norwegian and Swedish owners account for one forth of the fleet. Israeli owners (including Ray Shipping and Zodiac Maritime Agency) are responsible for 9% of capacity (Clarkson Research Services Limited, 2013).

3.4.6.2 PCC market structure

There are three ways for car carrier operators to participate in the car carrier market (i.e. owners and operators):

- **Major operators:**

Large car carrier operating companies control the majority of PCC capacity, either themselves or via subsidiary companies by owning or chartering vessels. These operators include the top three Japanese carriers NYK, MOL and K-Line, along with

other operators such as Wallenius Wilhelmsen Logistics (jointly owned by Wallenius Lines and Wilh. Wilhelmsen), Eukor, Hyundai Glovis, Hoegh Autoliners and Grimaldi.

- **Smaller operators:**

Besides the major operators, there are also a number of smaller operating companies, such as Abou Merhi and Sallaum Lines which provide some car carrier services on relatively lower-volume, emerging trades. These include services on the emerging trade of secondhand cars from Europe to North Africa, and trade across the Atlantic.

- **Charter owners:**

Instead of operating their PCC vessels by themselves, the owners charter out vessels under time charter arrangement. Major charter owners include Cido Shipping, Ray Shipping and Zodiac Maritime Agency.

Source: (Clarkson Research Services Limited, 2013).

3.5 Cooperation mode between major global automobile manufacturers and car carrier companies

Since the PCC is a very specific professional type of vessel, it is only suitable for shipment of goods like cars (the main type of cargo), construction machinery, mafi plate loaded heavy goods by means of "Roll-on, Roll-off". These characteristics determine that car carrier companies must establish very close relationships with the major car manufacturers, otherwise they will lose the basis of survival and development.

By analysing the cooperative relation between the top seven car carrier companies and major automobile groups in the world, the cooperation contains three main models.

3.5.1 Japanese model: cooperation under the control of Japanese consortium

The Japanese consortium jointly holds the shares of automobile manufacturers and car carrier companies to establish business alliances by ties of equity stake. The figures below are Japan's largest automobile manufacturer Toyota and the Japanese mainland top three car carrier companies' largest ten shareholders in 2013.

Table 16 Top 10 Largest Shareholders of TOYOTA

No.1	Japan Trustee Services Bank, Ltd.
No.2	Toyota Industries Corporation
No.3	The Master Trust Bank of Japan, Ltd.
No.4	State Street Bank and Trust Company (standing proxy: Settlement & Clearing Services Division, Mizuho Bank, Ltd.)
No.5	Nippon Life Insurance Company
No.6	The Bank of New York Mellon as Depositary Bank for Depositary Receipt Holders
No.7	Trust & Custody Services Bank, Ltd.
No.8	DENSO CORPORATION
No.9	Mitsui Sumitomo Insurance Company, Limited
No.10	State Street Bank and Trust Company (standing proxy: The Hongkong and Shanghai Banking Corporation Limited, Tokyo Branch)

Source: (TOYOTA, 2014)

Table 17 Top 10 Largest Shareholders of MOL

No.1	Japan Trustee Services Bank, Ltd.
No.2	The Master Trust Bank of Japan, Ltd.
No.3	Mitsui Sumitomo Insurance Co, Ltd.
No.4	Sumitomo Mitsui Banking Corporation
No.5	Trust & Custody Services Bank, Ltd.
No.6	The Nomura Trust & Banking Co., Ltd.
No.7	Mizuho Bank, Ltd.
No.8	JUNIPER
No.9	The Bank of New York Melon SA/NV 10
No.10	State Street Bank West Client-Treaty

Source: (MOL)

Table 18 Top 10 Largest Shareholders of NYK

No.1	The Master Trust Bank of Japan, Ltd.(Trust Accounts)
No.2	Japan Trustee Services Bank, Ltd.(Trust Accounts)
No.3	The Master Trust Bank of Japan, Ltd. (Mitsubishi Heavy Industries, Ltd. Account (Retirement Allowance Trustee Account))
No.4	Tokio Marine & Nichido Fire Insurance Co., Ltd.
No.5	Meiji Yasuda Life Insurance Co.,
No.6	Mizuho Bank, Ltd.
No.7	Japan Trustee Services Bank, Ltd.(Trust Accounts 1)
No.8	Japan Trustee Services Bank, Ltd.(Trust Accounts 9)
No.9	State Street Bank West Client-Treaty
No.10	Japan Trustee Services Bank, Ltd.(Trust Accounts 6)

Source: (NYK)

Table 19 Top 10 Largest Shareholders of K-LINE

No.1	Japan Trustee Services Bank, Ltd.(Trust account)
No.2	The Master Trust Bank of Japan, Ltd.(Trust account)
No.3	Trust & Custody Services Bank Ltd. (Kawasaki Heavy Industries, Ltd. retirement benefit trust account re-trusted by Mizuho Trust & Banking)
No.4	JFE Steel Corporation
No.5	Sompo Japan Insurance Inc.
No.6	The Bank Of New York Jasdec Treaty Account
No.7	CBNY DFA Intl Small Cap Value Portfolio
No.8	Nippon Life Insurance Company
No.9	Tokio Marine & Nichido Fire Insurance Co., Ltd.
No.10	Japan Securities Finance Co., Ltd.

Source: (K-LINE, 2013)

As can be seen from the above figures, the largest shareholder of Toyota is Japan Trustee Services Bank, Ltd, who is also the largest shareholder of MOL and K-LINE as well as the second largest shareholder of NYK. The third largest shareholder of Toyota, the Master Trust Bank of Japan, Ltd. is the second largest shareholder of MOL and K-LINE and the largest shareholder of NYK. The top ten shareholders of HONDA, NISSAN and other automobile manufacturers are similar to those of the largest three car carrier companies (HONDA, 2014; 4-Traders, 2014).

The Japanese consortium promoted the development of automobile manufacturers and car carrier companies simultaneously. When Toyota developed a capacity expansion strategy and car export plan, car carrier companies would adjust their fleet development plans accordingly. On the other hand, the Japanese car carrier companies also coordinated to deploy proper capacity on reasonable shipping routes

between themselves. It is the systematic arrangement of industry that yeilds comparatively order development in the Japanese car carrier industry, which could effectively avoid capacity shortages and surpluses.

3.5.2 South Korean model: automobile manufacturers directly hold shares of car carrier companies

Hyundai began to develop its own car carrier fleet when its car exports rose to a large scale. However, the Hyundai Group sold 80% of its equity interest to the parent company of Wallenius Wilhelmsen in 2002 due to the Hyundai Group's financial collapse after the South-East Asian economic crisis and it was renamed as EUKOR. The Hyundai Kia Automotive Group holds a 20% stake of EUKOR. Now EUKOR Car Carriers is a joint venture between Wilh. Wilhelmsen ASA (40%), Wallenius (40%), Hyundai Motor Company and Kia Motors Corporation (20%). EUKOR is party to contracts for ocean transportation of Hyundai and Kia cars out of Korea (Wilh. Wilhelmsen Group; EUKOR).

In 2010, Hyundai Glovis Company Limited, in which a 20% stake was held by Hyundai Kia Automotive Group, acquired CIDO Shipping (KOREA) Company Limited, and thereby gradually established a large car carrier fleet, serving the Hyundai Kia Automotive Group's export logistics. Wilh. Wilhelmsen ASA holds a 12.5% share interest in Hyundai Glovis, directly and through WL. Hyundai Glovis' principal activity is logistics and distribution services (Wilh. Wilhelmsen Group). In this way, Hyundai Kia Automotive Group has established a complete seaborne automobile logistics chain through its direct shareholding.

3.5.3 European model: long term strategic cooperation with automobile manufacturers and car carrier companies independently

Different from consortium and shareholding, automobile manufacturers outsource the car shipping logistics to third parties on long-term basis. Automobile manufacturers and car carrier companies only concentrate on their respective core business and coordinate the development by strategic cooperation. For example, Wallenius Wilhelmsen and HOEGH estatablished strategic coopeation with Volkswagen, GM, FORD and Daimler AG by long-term contracts of affreightment.

The most prominent feature of the three models is that long term stable strategic cooperation has to be established between car carrier companies and automobile manufacturers. In the meantime, the automobile manufacturers also have fixed car carrier companies to provide shipping logistics. This is a symbiotic relationship. On the one hand, the car carrier company can develop its fleet harmoniously according to the expansion and export plan of the automobile manufacturers. On the other hand, automobile manufacturers need car carrier companies to provide sufficient shipping space, reliable schedules and controllable cost of freight. This collaboration supports the development of global seaborne car transportation in a long run. This is one of the important reasons why the car carrier shipping market was the best performing one that recovered from the financial crisis compared to the container lines, dry bulk and oil tanker markets.

3.6 Containerised car transportation

Containerised car transportation has developed quickly in recent years with the container fleet growing to be the most important transportation mode and it seems that containervessels can transport various kinds of good. The large-scale of container vessels, world-wide container lines and improved car packing technology in containers make it attractive to car transportation.

3.6.1 Comparing the main transport modes: car carriers, container vessels and bulk vessels

Table 20 Comparison of Three Transport Modes for Car Shipping

	Loading/ unloading efficiency	Quality	Cost	Terminal Facility Required	Volume	Vehicle Types
Car carrier	High	Good	Lower	Low	Large	Many
Container vessel	High	Fair	Low	High	Large	Less
Bulk vessel	Low	Poor	High	Fair	Small	Many

The table 20 indicates that the bulk vessel is the least proper transport mode and it is seldom used in reality. The door to door service of container mode is competitive compared to car carriers, although the container vessel needs special cargo handling facilities in the terminal,.

The following is an example to compare the transportation of 1000 cars of CHERY's cars branded QIYUN from the factory to Santos Port in Brazil by container vessel and car carrier.

Container vessel:

Four cars in one forty foot container (FEU), total 250 FEUs. Cars are transported from the factory in Wuhu to Shanghai Port by the Yangtze River or by road, then transhiped from Shanghai Port to Santos Port by container vessel.

PCC:

Cars are transported from the factory in Wuhu to Shanghai port by the Yangtze River, then transhiped from Shanghai port to Santos Port by PCC.

Table 21 Comparison of Cost and time for one Car Transportation in Different Modes

Transport Mode	From Factory in Wuhu to Shanghai Port by river		From Factory in Wuhu to Shanghai Port by Road		From Shanghai Port to Santos Port		Total	
	Cost USD	Time days	Cost USD	Time days	Cost USD	Time days	Total Cost USD	Least Total Time days
Container	108	4	216	3.5	700	34	808-916	37.5-38
PCC	80	5	110	4	679	32	759-789	36-37

Source: investigation

The table 21 shows clearly that PCC is better than container vessels in cost in car transportation. It can save at least 16USD for transporting one car from Shanghai to Santos by PCC compared to container vessels, while the period of carriage is almost the same.

3.6.2 The advantages of container vessels in car shipping

- Container transportation can increase turnover and reduce or even achieve zero inventories for automobile manufacturers. This mode is fit for small volume transportation from the factory to the objective market frequently according to the production.
- Container transportation can realise least logistics time. The finished vehicles do not need to be stocked in the yard in large volume waiting for car carriers. When the time comes for build-to-order (BTO) of customers, just in time in logistics is very important to improve customer satisfaction.
- Container vessels have more liners, schedules and higher density than PCCs do.
- Container transportation can provide door to door service and there is no chance for touching the vehicles during the period.

- The technology of vehicle packing in the container has been continuously improved and the quality of transportation has increased greatly.
- The large amount of redundancy of container vessel capacity makes the freight very low. Therefore, the container lines are eager to grasp the large and stable customers of automobile manufacturers to gain profit.

3.6.3 The advantages of PCCs in car shipping

- The freight is low. The freight rate will be fixed and very cheap in a long-term transportation contract.
- PCCs are designed especially for transporting large volumes of vehicles safely and efficiently with low cargo damage rate.
- PCCs are suitable for transportation of not only cars but also commercial and construction vehicles, and even large machineries.
- PCCs have low requirements for port conditions. Loading and unloading from PCCs are flexible and do not need cargo handling facilities.
- PCCs can provide high turnover and efficient loading/unloading services.
- PCCs are more environmental protective than container vessels and bulk vessels. The new environmental friendly car carrier developed by Japan is equipped with solar cell panels on the deck, which could realize zero CO2 emissions in the port.

3.7 Summarised analysis of the possibility and necessity of development of China’s car carrier industry by SWOT method

Based on the above description and analysis of global and China’s automotive industry, car trade and PCC fleet, the strengths and weaknesses that the car carrier industry possesses and opportunities and challenges the car carrier industry is

confronting will be analysed to present the advantages and disadvantages for development of China's car carrier industry panoramically.

Table 22 Outlines of SWOT of China's car carrier industry development

Internal	**Strengths**	**Weaknesses**
	● Structure of shareholders of shipping companies and automobile manufacturers in China ● Exiting subsidiaries, agents and logistics network	● Limited fleet scale ● Limited shipping routes and small volume of transportation ● Lack of stable long term cooperation with automobile manufacturers
External	**Opportunities**	**Threats**
	● Development of the global automotive industry ● Antitrust probe to the monopolist of car carrier industry ● China's automotive industry in a stage of development to be stronger ● The inevitable trend of large-scale car exports in the future ● Chinese government's support and encouragement of car shipping ● Geographical location of Chinese automobile manufacturers	● Difficulties and challenges in China's automotive industry ● Limitation of Chinese car export ● Characteristics of international car carrier industry ● Containerisation of car transportation

3.7.1 Strengths

3.7.1.1 Structure of shareholders of shipping companies and automobile manufacturers in China

The major shareholders of most Chinese automobile manufacturers are central or local government except GEELY and GWM, so are those of China's large shipping companies.

Table 23 The Equity Structure of Top 5 Automobile Manufacturers and Top 4 Shipping Groups

Automubile Manufacturers	Major Shareholder	Shipping Groups
SAIC MOTOR		COSCO
DFM		China Shipping
FAW Group	SASAC	SINATRANS-CSC
CHANGAN Automobile		ANJI Logistics(Soly owned by SAIC)
GAC Group		

Source: (SASAC)

The SASAC (State-owned Assets Supervision and Administration Commission) owns shares of both large automobile manufacturers and shipping companies. It is easier to establish closer industrial consortia than in Japan.

3.7.1.2 Existing subsidiaries, agents and logistics network in the world

The prominant shipping companies in China, such as COSCO, China Shipping and SINOTRANS-CSC, have already established their own logistics companies and agencies all over the world. Large automobile manufacturers also have their distribution network.

China Shipping, focusing on shipping as the main business is also actively involved in terminal management, comprehensive logistics and shipping agencies. China Shipping's oversea network includes 86 countries and regions with more than 110 companies and representatives, and more than 300 marketing networks, which,

therefore, created a high level of global operation capability. China Shipping set up China Shipping Logistics Co., Ltd. in March 1998. The Hong Kong holding was established in the same month in 1988, which was an important step to go oversea. Eight regional companies, the European Holding, North America Holding, Southeast Asia Holding, West Asia Holding, Korea Holding, Japan Company Ltd and Australia Agency have been established since 1999 to build overseas networks covering five continents to serve global container shipping lines of China Shipping. At present, China Shipping has 14 terminals in which the company has invested or hold shares (China Shipping).

Figure 31 Global Network of China Shipping (Group) Company

Source: (China Shipping)

COSCO has 9 regional companies in Hong Kong, America, Europe, Singapore, Japan, Australia, South Korea, West Asia and Africa as the radiation points. It owns more than 1,000 companies and branches in over 50 countries and regions. COSCO's shipping lines cover over 1,600 ports in more than 160 countries and regions worldwide. COSCO owns and operates 32 terminals worldwide, with 157 berths offered and have ample logistics facilities and resources in 2013 (COSCO).

SINOTRANS&CSC is the biggest comprehensive logistics service supplier and the second largest shipping agency in China with world-wide business. SINOTRANS&CSC is the largest key inland shipping corporation group and the only shipping company with integrated logistic services in offshore, ports, Changjiang River and canals. Under it, there are more than 730 domestic companies. Its business covers most of China, as well as over 50 countries and regions, such as Hong Kong, Taiwan, South Korea, Japan, Canada, U.S. and Germany. Additionally, SINOTRANS&CSC has established agency relationships and strategic cooperation partnerships with over 400 noted foreign transportation and logistics suppliers (SINATRANS&CSC).

Car carrier companies can take advantage of their parent companies' existing ship operation and management experience, resources and service networks to establish integrated logistics networks.

3.7.2 Weaknesses

3.7.2.1 Limited fleet scale

The capacity and number of PCCs of Chinese shipping companies are very small, and they are unable to provide various lines to meet the demand of automobile manufacturers in the short term (Liu, 2014).

China's PCC fleet contains 58 vessels with a total capacity of 77191ceu at the beginning of July 2014. The capacity is 2.11% of the world's fleet and the number represents 7.67% of the total number of vessels (Clarkson Research Service, 2014). However, the automobile production of China is approximately 23% of the world capacity and seaborne car trade of China is 10.67% of the world volume (Clarkson Research Services Limited, 2013).

The experience in automotive logistics of Chinese car carrier companies is still insufficient. An obvious division exists in the advantages of efficiency and cost between Chinese and foreign companies.

3.7.2.2 Limited shipping routes and small volume of transportation

Only NYKCOS deployed vessels on international shipping routes for China's car exports, which is also a booking window for NYK to participate in China's car exports shipping. SINATRANS-CSC chartered out one vessel in internal shipping. No other Chinese car carrier companies have taken part in the operation of shipping of China's car exports. They only engaged in coastal and inland river ro-ro tranportation.

Nevertheless, the PCC capacity is surplus at present. The loading rate was around 50% to 60% of CSCC, NYKCOS and Sinotrans-CSC. Ansheng is an exception whose loading rate can reach 80% for its parent company is SAIC (CSCC, 2014).

3.7.2.3 Lack of stable long term cooperation with automobile manufacturers

Before the emergence of Chinese car carrier companies, the Chinese car exports totally depended on foreign shipping companies and suffered discrimination of space and freight rate. The automobile manufacturers really hope that Chinese shipping companies can help them solve the problem. The features of China's car exports are in small batches with wide destination and maily commercial vehicles. Chinese car carrier companies have only limited small vessels which can not provide the services that manufacturers needed. The Chinese manufacturers had to turn to the foreign shipping companies, which further curbed the development of Chinese car carrier companies. Thus car carrier companies always complained about the disloyalty of Chinese manufacturers. On August 17 2006, Vice Premier Wu Yi and COSCO

president Wei Jiafu attended the ceremony of COSCO signing a strategic cooperation agreement with 17 automobile manufacturers in car shipping (COSCO, 2006). Then the major car carrier companies began to expand their fleet by chartering or building vessels. Things may get better gradually but for the 2008 financial crisis which took a heavy toll on car exports. Chinese car carrier companies lost a lot of money in investing and chartering PCCs at high prices and could not recover until now. Long-term stable strategic cooperation has not been established between main car carrier companies and automobile manufacturers.

3.7.3 Opportunities

3.7.3.1 Trend of the global automotive industry

Global car exports will maintain stable growth, mainly because the economies of Europe, the US and other developed countries have been in the process of gradual recovery. China and ASEAN（Association of Southeast Asian Nations）countries will continue to maintain rapid economic growth, which will promote the steady increase of the global car exports.

The economic growth of emerging countries, popularity of modular production and industrialized production of new energy cars have changed the direction of China's automotive industry. The center of the global automobile market transferred gradually from developed countries to developing countries, and so did the distribution of centers of automobile manufacture, operation and R&D. The advantage of low cost of personnel in R&D in China and India began to stand out. They accumulate high levels of R&D ability in the middle and low end cars. Local companies in emerging countries may also gradually develop into companies with worldwide influence by means of acquisition of international brands and advanced technology. When the US and Europe in their own countries focus on promotion of high value-added business, such as automotive design and development of core

components and modules by re-industrialization, China and India, as representatives of the emerging automobile manufacturing centers will also get valuable development opportunities through restructuring of R&D resources.

The developed countries continue to increase the R&D of new energy technologies under the pressure of environmental protection and energy security after the international financial crisis. The major automobile manufacturers, such as GM, VOLKSWAGEN, TOYOTA and Renault-Nissan are all concentrating on R&D of electric cars (DRCSC, SAE of China, Volkswagen Group China, 2013). China, a latecomer participating in the global new energy automotive industry, not only depends on its automotive industry scale, but also is based on technology and capacity in power batteries, electrical motors and electronic controls, as well as infrastructure service capabilities.

The industrialized production of new energy cars will change the competition in the global automotive industry, which could provide new opportunities for China's automotive industry in this area. For example, SAIC, CHERY and BYD have made considerable progress in the field of new energy cars (GASGOO, 2014).

3.7.3.2 Antitrust probe to the monopolist of car carrier industry

A number of the large PCC operators were involved in an antitrust probe in September 2012. The offices of the vehicle transport divisions of the three big Japanese lines (NYK, MOL and K-Line) were visited by authorities from the Japan Fair Trade Commission, while other operators including Wallenius Wilhelmsen Logistics and Eukor Car Carriers were also subjected to visits by various antitrust inspections and requests for information. Competition authorities in Japan, the US, Canada and Europe have launched a coordinated antitrust investigation against car carrier companies, to see whether there is any infringement of competition law related to price cooperation between the operators, or to allocation of customers.

In mid-2013, private action against PCC operators was reported, following the raids by antitrust authorities in 2012. Companies in both Florida and California, seeking class-action lawsuits, have sued a number of major PCC operators (reportedly together accounting for around 70% of the global shipping market), accusing them of agreeing to fix, stabilize and maintain prices (Clarkson Research Services Limited, 2013).

3.7.3.3 China’s automotive industry is just in a stage of development to be stronger

The average annual growth rate of automobile production was 19.99% from 2000 to 2013 and 12.53% from 2009 to 2013 in China (CAAM, 2014). According to the planning of the Chinese government, future GDP growth should be maintained at 7%. China’s automobile production and sales will be over 40 million cars in 2020 based on production of 22.11 million cars in 2013, if the average annual growth is 8%. China has been the largest country in car production and sales but it still has a large gap beyond advanced countries in the automotive industry. Chinese automobile manufacturers need to cooperate with multinational motor companies for a period. China’s automotive industry is in a crucial stage to become stronger both in terms of production and technology.

3.7.3.4 Large-scale car exports is an inevitable trend in the future

- **The current situation for Chinese car export**

China Association of Automobile Manufacturers forecast that the full-year demand for 2014 would range from 23,850,000 to 24,290,000, and China's car sales for the full year would be between 23.74 and 24.18 million, an increase of 8% to 10% (CAAM, 2014). The transfer of the global automotive industry to emerging countries will continue to promote the improvement of China’s automotive industry.

China’s automobile production and sales have been ranked the first since 2009 and became the most important car market in the world. China’s automotive industry has developed rapidly for more than 30 years. The production of finished vehicles and components compose part of the global automotive industry. Chinese automobile enterprises have mastered a certain level of advanced technology of automobile manufacturing, established a complete supporting system, accumulated a wealth of experience and cultivated a group of senior professionals in the process of cooperation with foreign companies. Currently, the basic conditions for large-scale exports of Chinese cars have been available both from China’s automotive industry’s needs to be bigger and stronger, and from the economy of scale, or from the economic strength, technology and management of automobile enterprises.

First of all, the automotive industry is a highly globalized and large-scale industry. Powerful or not, a country’s automotive industry is determined by its recognition and market share in the international market, which is the reason why the automotive industry in advanced automobile countries carried out worldwide integration of sales and resources. Therefore, encouraging Chinese car exports is an inevitable choice for the automotive industry continuing to enhance the competitiveness.

Secondly, economy of scale is significant in the automotive industry. As the costs of technology R&D are continuing to increase as well as the improvement level of productivity, the minimum efficient scale in the long-run average cost curve is also rising. Therefore, Chinese automobile manufacturers strive to gain greater development space by car exports using both domestic and international markets and resources, which are decided by the law of development of the automotive industry.

In addition, Chinese automobile companies, especially some self-owned independent brands survived from fierce competition in the domestic market, have

made great progress in technology and management. They have the resources and capacity to implement the internationalization strategy after struggling in the world automotive industry many years.

- **The impetus of Chinese car exports**

Attracted by the large market capacity and low manufacturing cost, almost all international automobile enterprises entered China by means of joint ventures and cooperation, which made China the most fierce competition car market. Chinese independent brands grew and developed in this tough environment all the time. However, generally the joint venture brands and self-owned brands can share the market due to their focusing on two different market segments of the high-end and low-end respectively. Nevertheless, two factors made this situation changed since the 2008 financial crisis.

Firstly, the Chinese auto market entered into a stable period after more than ten years of rapid growth. The inertia of capacity expansion and expectation of slowing down of market growth intensified market competition.

Secondly, the sluggishness of the international automobile market compelled multinational companies to pay more attention to Chinese market. Even the low-end markets have entered their vision. Thus the pressure on Chinese independent brands increased sharply. To explore living space in overseas markets and improve productivity utilization have become one of the engines of Chinese car export.

Chinese independent brand automobile enterprises have accumulated some comparative advantages in middle and low-end products and manufacturing cost in some areas.

- **Future development of Chinese car exports**

The commercial car export in China started from the 1990s, exceeded 10 thousand cars in 1993 and gradully increased after then (Zhang, 2013) . It took 19 years for Chinese car exports to grow from 10 thousand to 1 million cars. Currently, the Chinese government can not protect the automotive industry by measures previously used by the Japanese and South Korean Governments. Moreover, Chinese independent brand car manufacturers have endured unequal treatment compared to the joint ventures in many areas, such as taxes, financing and government protection. However, their ability to adapt to changes in the market are stronger after the fierce market competition. More and more Chinese automobile companies have actively participated in development of and competing in the global automobile market. SAIC acquired British Rover (SAIC, 2014), Geely Automobile acquired VOLVO (GEELY, 2014), Dongfeng purchased PSA (DPCA, 2014), and BYD and Daimler jointly developed electric cars (BYD, 2010).

There is a very large space for Chinese car exports to grow in the future. If China's automotive industry has made great progress in the core technology, quality and services, Chinese cars can enter into the huge global mature automobile market, such as West Europe and North America, which will greatly promote rapid increase of China's automotive industry and exports. Chinese car exports have exceeded 1 million in 2012, which is a basic volume to open stable ro-ro lines (Liu, 2014).

3.7.3.5 Chinese government support and encourage car shipping

In addition, with the realization of the importance of environmental protection, the advantages of low carbon emission, high efficiency and safety of maritime transportation have been recognized (Liu, 2014). In the 12th Five-year Development Programme of Transportation of China, the government set green, low emission, energy saving and environmental friend as the development mode to realise harmonious development of transportation, resources and environment (China

highway, 2011). The Chinese government supports the development of railways, encourages the development of waterways to implementation the environment protection policies.

3.7.3.6 Geographical location of Chinese automobile manufacturers

Although many Chinese automobile manufacturers used to be located in the inland area, when new factories were established, the location has been taken into consideration. Many manufactures have realised that ro-ro transportation is more efficient, cost saving and has low pollution emmisions, which promote the development of ro-ro transportation in river and coastal areas. With the changes in philosiphy of logistics, the development of ro-ro facility and PCC fleet, and the increase of exports, the demand for PCC fleet will be huge in the future (Liu, 2014).

3.7.4 Threats

3.7.4.1 Difficulties and challenges in China's automotive industry

China's car exports are in its primary stage with challenges and difficuities.

- Firstly, the domestic market is not strong enough to be the back-up of Chinese automobile enterprises when they struggle to explore the international market.
- Secondly, the image of Chinese car brands is not so positive. Chinese automobile enterprises should endeavor to rebuild their brands in a long term by overall improving technology, quality and services.
- In addition, the quality of Chinese cars is not attractive. The quality can be the priority issues affecting the brand's image. Although Chinese automobile enterprises target the low-end cars, the low end does not mean low quality. These quality issues may not be fatal, but it will seriously damage the reputation of Chinese cars.

- Finally, the extensive development and disorderly competition between Chinese automobile enterprises in the process of internationalization must be changed as soon as possible.

3.7.4.2 Limitation of China's car exports

China's car exports are in a wide range of areas with small volume in each objective market. The competitiveness of most Chinese independent brand cars is very weak. There are large discrepancies between Chinese independent brand cars and famous foreign brand cars in core technology, quality and services (Liu, 2014).

The core technology and quality of most Chinese independent brand cars lag behind foreign cars of developed countries. Chinese cars are squeezed in the low market segment. It is impossible to enter the European and other mature markets by large volume. Meanwhile, the objective market of exports are mainly concentrated in Southeast Asia, South America, Africa and Eastern Europe. China has only one local shipping company opening a shipping line from China to the Persian Gulf and North-west Africa. Other lines are yet to be developed (Liu, 2014).

3.7.4.3 Characteristics of the international car carrier industry

The international car carrier industry is characterized by a high degree of specialization and market monopoly with high barriers to entry and exit. It is very difficult for new car carrier companies to enter the dominant European market (Liu, 2014). The majority of car carriers are operated on liner-style services based on regular sailing schedules with fixed frequency and port calls. The large operators typically utilize PCCs on the major deep-sea trade routes. They have signed contracts of affreightment (COA) with major automobile manufacturers, especially those in the Far East, such as Toyota, Honda, Hyundai and Nissan. Major vessel operators typically own vessels, but also often charter in tonnage on a long-term

basis from charter owners. Ownership of PCC fleet is relatively consolidated; however, there are also a number of co-ownership arrangements that result in commercial control of vessels being even more concentrated amongst the top major operators, who often have large stakes in some smaller operating companies.

The top three Japanese owners alone, Nippon Yusen Kaisha (NYK Line), Mitsui OSK Lines Ltd (MOL) and K-Line together controlled 28.03% of the global fleet capacity in 2013 (Clarkson Research Services, 2014). They can further control more capacity by time charter of vessels or share holding of other companies. The car carrier companies in figure 32 controlled 61.98% of the global fleet vessels.

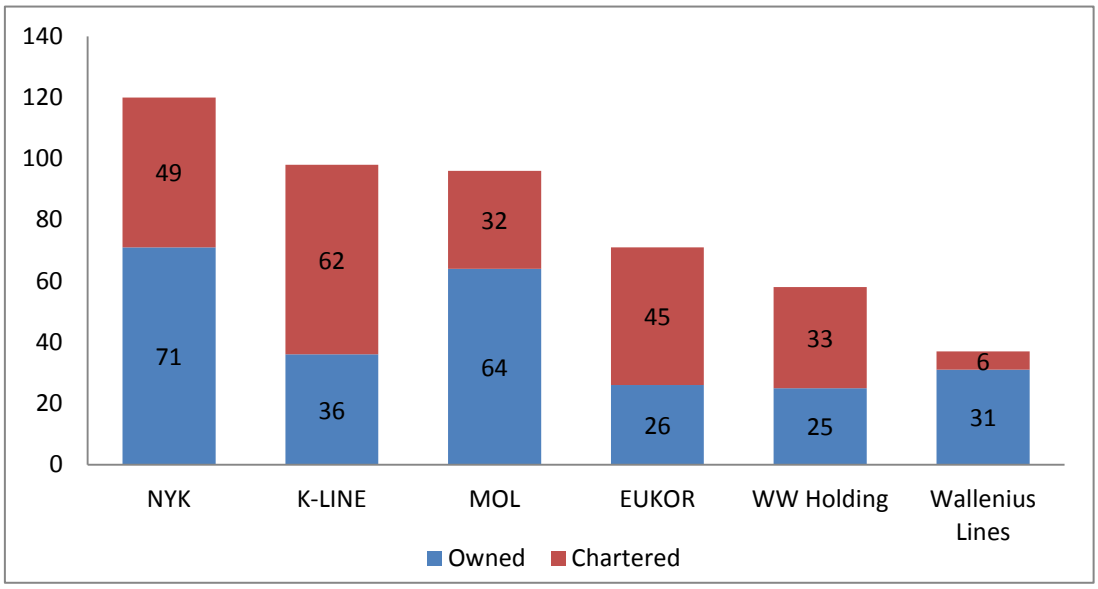


Figure 32 Vessles in Operation – Owned vs Chartered Tonnage

Source: (NYK; K-LINE, 2013; MOL, 2014; NYK; K-LINE, 2014; EUKOR; Wilh. Wilhelmsen; Wallenius Lines)

In addition, since cars are high value-added goods, automobile manufacturers require car carrier companies to provide global transportation networks, high-density schedules, high quality transportation and other specialized services. Therefore, car shipping companies are deemed as a part of the automotive logistics chain. The

world's major automobile manufacturers either have cross holding shares with shipping companies or outsource third party car carrier companies to be responsible for their logistics. In this way, the major car carrier companies grow to be virtual monopolists in the international auto shipping market (Liu, 2014).

3.7.4.4 Containerization of car transportation

Containerised car transportation already existed and has become more and more popular with the rapid development of container lines, gigantism of container vessels and technical progress in recent years, which really challenge and may significantly impact the development of PCC fleet and terminals. The reasons can be outlined as follows.

- Insufficient car carriers in non-dominant markets.
- Infrastructure limits in emerging markets.
- Small volume of vehicle import and export in some markets.
- Increase in lines and schedules of container transportation.
- Demand for high speed and frequency transit for high-valued cars.
- Decline of freight rates in the container market due to economy of scale (Automotive Logistics, 2012).

Car carriers are the dominant mode of car shipping in the world and could be replaced by container vessels in the future probably.

4 Strategic development plan for China’s car carrier industry

China’s large shipping companies have always been hesitant in investing in car carriers. For one thing, they are lacking experience in operating the car carrier fleet and are not confident at competing with magnates of global car carrier companies. Further, they worry that thevolume of China’s car exports may not be sufficient enough to cover their operating costs. This concern indeed is reasonable. China’s car carrier companies, as the new comer to the monopolised car ro-ro shipping market shoud establish a correct and effective long-term development strategy rather than blindly take hasty short-term action.

As car shipping is derived from car trade, the development of car carriers should be coordinated with the prosperity of the automotive industry. China’s automotive industry should learn from the experience of Japanese and Korean automobile industry developments. Meanwhile, China’s car carrier industry should learn from the experience of Japanese and Korean car carrier developments. Similar mistakes could be avoided to be repeated.

4.1 The inspiration of internationalization of Japanese and Korean automotive industries

Chinese automobile manufacturers should positively participate in the international operations. The car carrier industry is a service industry to provide shipping services for the automotive industry. Whether the car carrier industry can achieve great improvement with competitiveness, it largely depends on the level of development of the domestic automotive industry. China should dedicate in strengthening

independent innovation capability to master core technology and participating in new technology development over the next decade. China's independent automobile enterprises have already started internationalization based on their own conditions. China's automotive industry should learn from the experiences and lessons of the Japanese and South Korean automotive industry as they have experienced a similar process.

- Government's strategic guidance, protection and incentive measures are crucial. Although it is impossible for China to close the domestic market in the present international environment, the Chinese government could give sufficient confidence and support to the automobile enterprises by making top-level design and strategic plans for the automotive industry in internationalization. It is still feasible to provide support in the areas of insurance and credit.
- The development of China's automobile components industry must be attached the same importance to achieve harmonious progress as China's automotive industry in internationalization.
- Chinese automobile companies should establish a long-term vision in building good image in the international market. They should concentrate on market research, accurate market positioning, quality awareness building, R&D strengthening, international talents training and the establishment of a sound service system.

During the process of internationalization, China's automobile companies can not only gain market shares, but also learn lessons and experiences from success and failures to improve their competitiveness in the automotive industry chain. The main objective markets for China's car exports are emerging and developing countries. The exported cars are generally low-end with comparative advantage in cost. Nonetheless, when the economy in emerging and some developing countries

pullulate, the advantage in cost will become weak because the demand for high-valued cars in these markets will blossom. Therefore, China's automobile companies should seize the precious opportunity to grow up quickly in quality and technology when the emerging markets and some developing markets just started expanding at the present time. Now or never, China's automobile companies should take advantage of this limited opportunity to improve their international competitiveness rapidly.

4.2 Taking local advantages to establish long-term stable strategic partnerships with key automobile manufacturers

The major shareholders of most of Chinese automobile manufacturers and large shipping companies are central or local governments. The SASAC are the representative of the government to hold and manage the state-owned enterprises. It is easier to establish closer industrial consortia than Japanese automobile manufacturers and car carrier companies. China's shipping companies could learn from the successful experience of the Japanese industry consortium to proactively establish strategic alliances with domestic automobile manufactures by their existing shareholding relationship. At the same time, they can also cross hold shares of each other to fund long-term strategic coopetation, like GWM and GEELY (Automarket, 2014).

Meanwhile, a cooperation platform can be built to serve both automobile manufacturers and car carrier companies, on which more shipping routes can be opened up by several car carrier companies to ensure car exports shipping. The priority can be given to their cooperation partners.

4.3 Establish strategic alliances with domestic and international car carrier companies

Strategic alliances should be established with other car carrier companies in the domestic and international markets by slot charter or exchange to achieve economies of scale. A case in point is the cooperation relationships between EUKOR and Hyundai Glovis with WALLENIUS WILHELMSEN. Liner shipping services are very important for car exports. More liners are available for car exporters. More capacity can be reasonably deployed in the most significant and profitable routes through alliances. The utilisation rate of the cargo space can also rise as the cargo sources are diversified. This will help to improve Chinese car exports and overall competitiveness of China's car carrier companies.

4.4 Build car carrier fleet with low capital cost when the shipping market is in its trough stage

The shipping company can make the best of the time when shipping market is in the trough stage, although it is miserable for all shipping companies when the shipping market cycle is in its trough stage. The trough stage of this marine shipping cycle is very unusual and will not occur even in a hundred years. All ranges of BALTIC indexes were incredibly high when it was at the peak of the prosperous period. The more vessels owned, the more profit could be earned. However, extravagant huge profits can not last for long. The veritable strength and viability will be revealed only after the prosperity. When the crisis suddenly appeared, many companies were confounded and some of them were even totally depressed. Althouth they all knew that prosperity will come eventually according to the law of the cycle, no one knew when the dawn would come. Many shipping companies, even large companies are still struggling to survive.

However, opportunities always intergrow with crisis as vitality will burst along with stagnancy. The shipping cycle is no exception. When the market is low, the newbuilding and second-hand vessel prices are also in a comparatively low scale. If a company can use the shipping cycle to adjust its business strategy at the right moment, by taking measures to evade the risk of uncertainty in the future in the prosperous period and grasp the opportunity to increase transportation capacity in the low period, the company will achieve its long-term optimum profit strategy.

The newbuilding price was very high in the period from the second half of 2004 to the first half of 2009, so the vessels delivered in 2007 to 2010 had to bear the pressure of high capital cost. Morever, the number of vesesl delivered in 2007 to 2010 were 188 accounting for 24.58% of the total number and 28.21% of the total capacity of the current fleet (Clarkson Rearch Services, 2014). It would be very hard for the owners of these vessels to cover the cost under the conditions of low charter and freight rate sin the car carrier market.

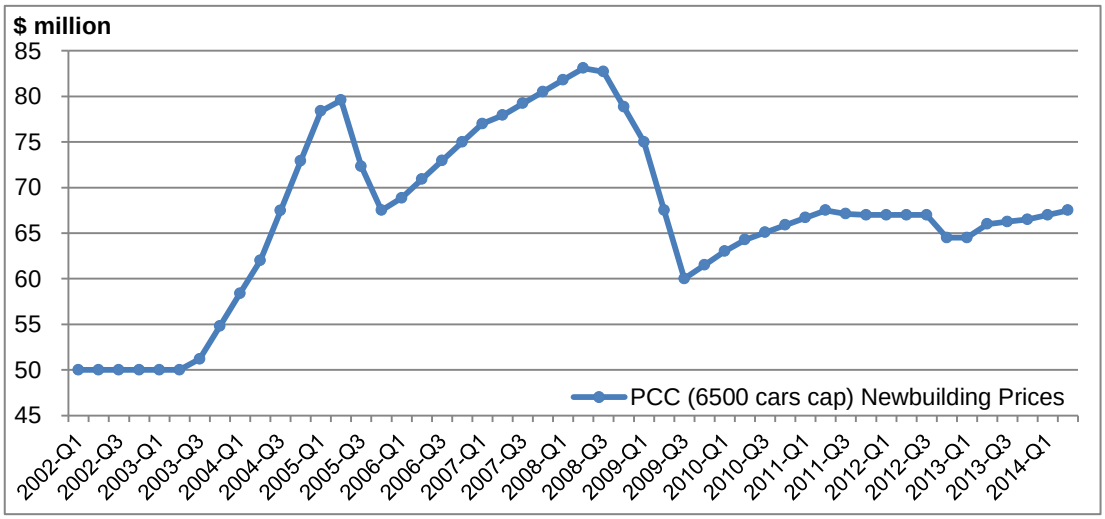


Figure 33 PCC (6500 cars capacity) Newbuilding Prices

Source: (Clarkson Research Services, 2014)

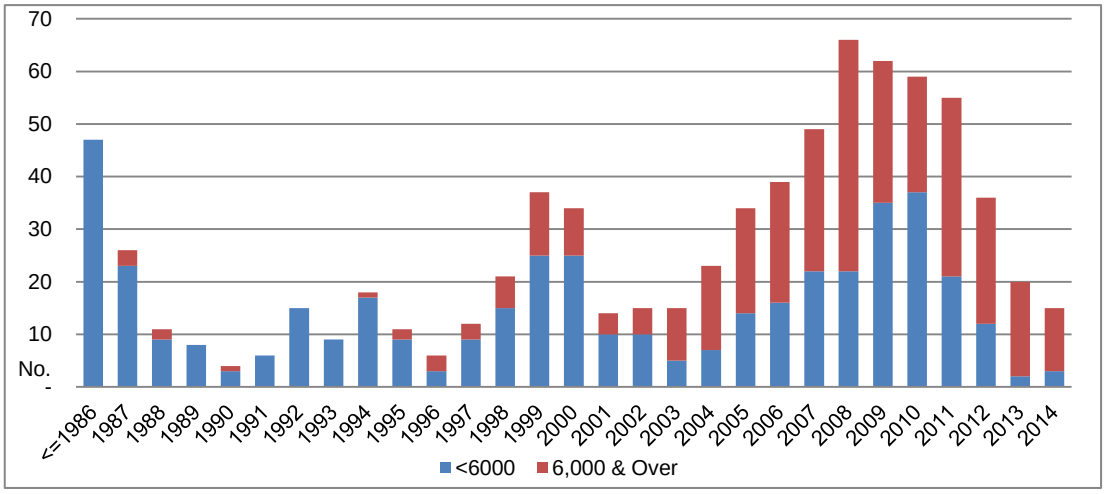


Figure 34 Current PCC Fleet by Year of Delivery

Source: (Clarkson Research Sercives, 2014)

China's car carrier companies should learn lessons of building vessels in improper time. They shoud build new vessels at comparatively low price when shipping market is in the low stage to obtain advantages of low fixed cost so as to improve their competitiviness.

4.5 Rationally select vessel type and use new technology to reduce operating costs and realise environmental protection

The financial crisis and high bunker price forced shipping companies to reduce their operating costs by all means. It is crucial to choose optimum type of vessel and use energy saving or new energy technology.

4.5.1 Economy of scale

There is an obvious trend of large-scale vessels in the shipping market. The average capacity was 3902ceu/vessel in 2005 and 4844ceu/vessel in 2014 (Clarkson Research Services Limited, 2013). As car carrier companies generally tend to arrange long-term COA with automobile manufacturers, and the preference for COA

business will continue and be strengthen, the larger the vesssel is, the lower the average cost, and the higher the profit.

The PCC charter market is relatively limited and opaque. Nevertheless, despite operators' increasing COA preference, time charter rates have risen since 2009. At the start of August 2013, the benchmark one year rate for a 6,500 ceu ship stood at around $23,000/day, while the benchmark rates for 4,500 ceu vessels stood at around $14,000/day. The difference in time charter rate between the two types of vessels is 9000USD/day, which means the larger the size, the higher the profit. In general, more flexible vessels, such as those with high and heavy decks, command a charter market premium (Clarkson Research Services Limited, 2013).

4.5.2 Energy efficiency

New energy-saving technology to reduce bunker cost should be adopted. The bunker cost is almost 50% of the operating cost in some shipping companies as the bunker price has been hovering at a high position for a long period (COSCOGZ, 2013). The common method of energy saving is slow steaming at present when the vessel capacity was surplus compared to the demand. It is not an optimum option in normal conditions because it really wastes the vessel capacity and may cause unpredictable effects to the engine and other machinery onbord. What can really save energy efficiently and safely is the advancecd technology of designing the main engine, the propeller system, the structure and shape of vessels, the process of energy consumption, the sources of energy and reuse of waste energy. In sum, new technolygy can provide more capacity with less energy consumption.

4.5.3 Environmental friendly and technological innovation

With the improvement and enhancement of environmental awareness and environmental protection, more and more measures have been taken to reduce

emissions and pollution. It is the minium requirement for car carrier companies to comply with international conventions and domestic regulations on pollution reduction. They should actively paticipate in vessel designing, technology innovation and new technology testing and adoption to to fulfill their commitment to environmental protection, resource-saving and eco-protection to assume their social responsibilities.

NYK is targeting at the achievement of “zero emissions” by 2050 and have designed the concept ship NYK Super Eco Ship 2030 as a milestone for 2030 with MTI (NYK’s subsidiary technology institute), Elomatic (a marine consulting company in Finland), and Garroni Progetti S.r.l. (a ship designer in Italy) (NYK, 2014).

K-LINE collaborated on the gas-fueled ships project with Kawasaki Heavy Industries, Ltd., which created the “green gas engine” fueled by natural gas for generating electricity, and with a pioneer of gas-fueled ship technology, Det Norske Veritas (DNV), the Norwegian Classification Society, which owns the pre-existing technolgy. NYK is applying the concept of commecial navigation of car carriers powered by LNG to develop technologies for reducing ship navigation CO_2 emissions by approximately 40%, sulfur oxides (SO_X) and particulate matter (PM) by approximately 100%, and nitrogen oxides (NO_X) by 80% to 90% (K-LINE, 2013).

4.6 Set up sound and sustainable operation mode for car carrier fleet

Rather than operate self-owned vessels, all the large car carrier companies charter in or out vessels in the shipping market based on overall consideration of cost, market and profit. Therefore, financial and operational risks should be controlled to make the whole company’s operation more stable and sustainable.

For example, together with subsidiaries and partners, Wallenius operates a fleet of about 160 vessels. Among the fleet, Wallenius owns or charters 37 vessels

(Wallenius Lines). Likewise, Wilh. Wilhelmsen ASA Group companies had a lifting capacity of 905,000ceu at the end of March 2014. The fleet represented 24% of the global car carrying capacity. The group controlled a total of 145 vessels by the end of the first quarter of 2014. They only own and charter in 58 vessels (Wilh. Wilhelmsen Group). Similarly, NYK controls 120 vessels including owned and time chartered vessels, but operates 198 vessls (NYKCOS). China's car carrier companies can learn from this kind of ship operation mode.

- The car carrier company can operate self-owned vessels with low capital cost to provide shipping services.
- The car carrier company can charter out his low captial cost vessels to others when it considers the charter rate is comparatively high, which can not only effectively diversify the risk of market volatility, but also share others' operating achievements.
- When the charter rate is low, the car carrier company can charter in vessels to meet his operation requirements at lower cost than building new vessels.

China's car carier companies should scientificly and rationally deploy and manage their fleet to keep profits or, at least to survive.

4.7 Design shipping routes and schedules scientifically

China's car carrier companies will continue to be squeezed and marginalized by their powerful competitors of large car carrier companies who have always monopolied the car shipping market. How to deal with the stress of the intensified competition will decide if China's car carrier industry can develop or even survive in the future.

The major car shipping routes at present are from Asia to the EU, from Asia to North America and from the EU to North America, which are the core routes of large car carrier compnies. In the near future, China's car carrier companies must avoid

deploying their main capacity in these major routes where many vessels have been arranged on the major shipping routes.

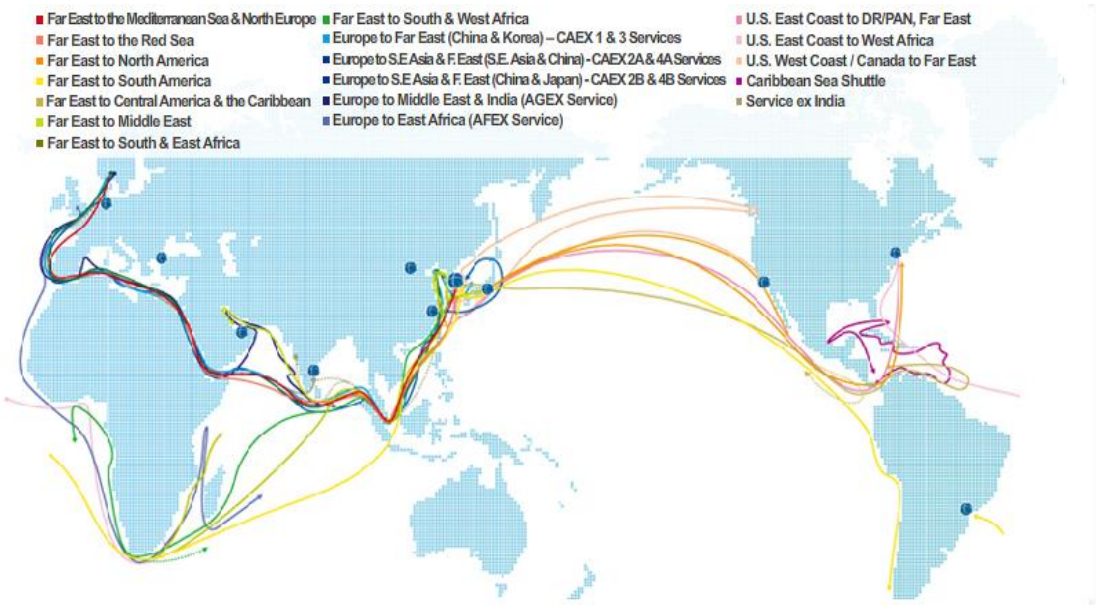


Figure 35 Services Routes of EUKOR

Source: (EUKOR)

The shipping routes of China's car carrier fleet should be designed based on the analysis of the direction and flow of China's car exports. The significant responsiblity of car carrier companies is to provide transportation services for manufacturers, which is the basis for car carrier companies to exist and grow.Therefore, car carrier companies should keep close tabs on changes in car exports volume and objective markets and cooperate closely with automobile manufacturers. Their fleet capacity should be harmoniously expanded and allocated with the development strategies of automobile manufacturers. The car carrier company should design shipping routes and schedules scientifically and select target markets with less fierce competition prudently.

Currently, the main objective for car exports markets of China are the Middle East and South America. The exports to the two areas accounted for 31.07% and 28.91%

of the total exports in 2013 respectively. Next are East Europe and South East Asia accounting for 13.30% and 7.49% respectively (Cui, 2014). Nonetheless, It is not easy for China's car carrier companies to break into the shipping lane to the Middle East because it is on the way of the major lane of the Far East to Europe.

The shipping routes from the Far East to the Black Sea and from the Far East to Central and South America are recommended because the competition on the two lines is relatively mild and the freight rates are stable: 55USD/m^3 for passenger cars and 90USD/m^3 for commercial cars. The loading rate is between 85% and 90% at present from Shanghai Port on a monthly schedule. The decision-making on shipping routes is the core of operating strategy which is crucial to the success of a shipping company.

4.8 Provide full range of strategic services for automobile manufacturers

All the large car carrier companies have created their global automobile logistics networks, such as WWL, NYK, MOL, whose core competitiveness is not only on marine shipping but also on road logistics. They take the functions as automobile manufacturer's logistics department, providing detailed customer specific logistics and value added services, including storage, pre delivery inspection (PDI), post production option (PPO), direct delivery to retailers, periodic maintenance, washing, battery charging and other requirements of the customers. Thus, the manufacturers can concentrate on improving the automotive products' competitiveness.

China's global automobile logistics networks are insufficient mainly due to the small and unstable volume of car exports. China's car carrier companies should make great efforts to establish the logistics networks to provide the whole process of logistics services for manufacturers. At the same time, they can create a high-quality logistics chain to enhance their competitiveness in the shipping market.

The top shipping companies in China, such as COSCO, China Shipping and SINOTRANS-CSC have already established their own logistics companies and agencies around the world. Large automobile manufacturers also have their distribution network. They can integrate these resources together to build intensive distribution centres, logistics networks and supply chain in domestic and overseas markets, which could reduce the cost and increase the profit margin for manufacturers. In addition, it can improve the competitiveness of and further gear the exports of Chinese cars.

COSCO and China Shipping's container lines cover most of the world's large ports. The car carrier companies can take advantages of the diversification operation of their parent companies to transport cars by container vessels when the volume is small or the destinatination is not the port on the car carrier routes.

5 Conclusion

Car shipping is derived from car trade. The development of China's car carrier industry depends on the scale and level of China's automotive industry. China's automotive industry has expanded rapidly since China joined the WTO in 2002 and became the largest automobile production country in the world in 2009. The production and sales accounted for 25.33% and 25.72% respectively of the global volume in 2013. The compound annual growth rate of production was 19.99% from 2000 to 2013, while the compound annual growth rate of sales was 18.25% from 2005 to 2013. During the period from 2009 to 2013 after the financial crisis, both the annual growth rates of production and sales reached more than 12.50% in China.

Compared to the huge amount of production, the exports were small, accounting for 4.28% of the total production in China in 2013. Most of the export automotive products were low-end cars. The value of the car exports accounted for 3.3% of the global automotive products export value in 2013. The Middle East and South America are the most important markets, accounting for 31.07% and 28.91% of China's total exports in 2013 respectively, followed by Europe and other Asian areas occupying 15.14% and 14.05% of the total exports respectively in 2013.

China's PCC fleet had 58 vessels with total capacity accounting for 2.10% of the global fleet capacity in July 2014. Most of them are small vessels with a capacity less than 2000ceu serving coastal and Yangtze River shipping. The majority of China's car exports shipping was controlled by the major global car carrier companies. The imbalance of the productivity of automotive industry and the capacity of the car carrer

fleet seriously hindered the development of China’s car exports. Many Chinese automobile manufacturers exported completely knocked down (CKD) and semi-knocked down (SKD) units of vehicles and set up assembly plants abroad as an alternative. The further development of the automotive industry needs the support of the car carrier industry.

The global automotive industry has developed steadily despite the financial crisis. The average annual growth rate of the global automobile output was 3.14% from 2000 to 2013. The automobile assembly lines of the world's traditional automobile manufacturing countries had been migrated to emerging countries gradually from the end of the last century. The proportion of the production of the BRICS countries increased from 12.88% in 2002 to 37.18% in 2013. Meanwhile, the production in North America, Europe, Japan and South Korea decreased from 82.56% to 52.90% during the same period. The sales in Europe accounted for 21.39%, in American 29.25%, and in Asia, Australia and the Middle East 47.43% of the global auto sales in 2013. However, the sales of the three regions were relatively close to each other during 2005-2007. The major car carrier shipping routes are from Asia to the EU, from Asia to North America and from the EU to North America.The largest seaborne car trade routes are from Asia to the EU and North America.

The global PCC fleet has 767 vessels with the capacity of 3.67m ceu at the start of July 2014. The international car carrier industry is highly concentrated and monopolized by a few large car carrier companies controlling most of the market shares. NYK, MOL, K-Line, EUKOR and WWL together controlled 61.98% of the global fleet capacity in 2013 by owning, chartering vessels or shareholding shipping companies. Therefore, the car carrier companies must establish very close relationships with the major car manufacturers.

There are basicly three cooperation models between the car carrier companies and the automobile manufacturers. The Japanese model is cooperation under the control of Japanese consortium; the South Korean model is the automobile manufacturers directly hold shares of car carrier companies; the European model is the automobile manufacturers outsource the car shipping companies for their logistics services on a long-term basis.

Although containers have much advantages in transportation of cars, car carriers are still the priority of automobile manufacturers at present and in the predictable future.

Based on the research of the automotive industry, car trade and PCC fleet of the world and in China, SWOT method was used to analyse the internal strengths and weaknesses of the car carrier industry possessing, and the external opportunities and challenges the car carrier industry confronting.

Strengths

The SASAC owns shares of both large automobile manufacturers and shipping companies, which make it easy to establish closer industrial consortia. The exiting subsidiaries, agents and logistics network of the top shipping companies and major automobile manufacturers can be utilised to establish a comprehensive logistics network.

Weaknesses

China car carrier fleet is limited in scale and shipping routes and has small volume of car transportation. The car carrier companies lack stable long term cooperation with automobile manufacturers.

Opportunities

The centre of gravity of production and sales of the global automotive industry gradually migrated to the emerging countries. Antitrust probe to the monopolist of car

carrier industry has been launched. China's automotive industry is in a stage of development to be stronger. Large-scale car exports are an inevitable trend in the future with the Chinese government's support and encouragement.

Threats

There are still many difficulties and challenges in China's automotive industry. China's car exports are in a wide range of areas with small volume in each market. The competitiveness of most Chinese independent brand cars is very weak. The international car shipping market is a highly monopolized market. Containerisation of car transportation could be an international trend in the future.

Strategic development plans for China's car carrier industry have been made on the basis of the analysis. The prosperity of the automotive industry is the precondition of the development of the car carrier industry. China's automotive industry and car carrier industry should learn from the experience of Japanese and Korean automotive and car carrier industries in the process of development and internationalisation to avoid repeating similar mistakes.

China should take the advantages of the SASAC as the common shareholders of both large automobile manufacturers and shipping companies to establish long-term stable strategic partnerships between each other. Strategic alliances should be established with other car carrier companies in domestic and international markets by slot charter or exchange to achieve economies of scale.

Car carrier fleets with low capital cost should be built when the shipping market is in its trough stage. 6000+ceu vessels are the dominant type of PCC at present. Large vessels should be chosen on international shipping routes to gain economy of scale. New energy-saving technology should be adopted to reduce operating costs and realise environmental protection. The car carrier companies should take every kind

of measures and actively paticipate in technology innovation to fulfill their commitment to assume their social responsibilities.

The car carrier companies can charter in or out vessels in the shipping market based on overall consideration to set up a sound and sustainable operation mode. The shipping routes from the Far East to the Black Sea and from the Far East to Central and South America are recommended in the near future based on the analysis of the direction and flow of China's car exports. The shipping routes can be adjusted according to the changes in car exports volume and target markets. The car carrier companies should build intensive distribution centres, logistics networks and supply chain in domestic and overseas markets by using their existing resources to provide a full range of strategic services for the automobile manufacturers. The world-wide container lines can also be used to transport small volume cars to diversified destinations.

Car carrier companies should proactively cooperate with automobile manufacturers step by step to realise industrial amalgamation through the extension of the logistics chain. In addition, develop a coordinated operating strategy to make themselves indispensable and competitive in parts of the automobile industrial chain to achieve sustainable development.

The competitiveness of China car carrier fleet has yet to be improved. Meanwhile, the space of of China's car carrier industry in the future is broad.

Since the limitation of time for data collection and research, the future production, sales, exports and the distribution of Chinese cars cannot be calculated and predicted. Thus, the scale of the PCC fleet and the deployment of vessels on shipping routes cannot be analysed accordingly.

REFERENCES

4-Traders. (2014, 9 21). *NISSAN MOTOR CO LTD (7201)* . Retrieved from 4-Traders Web site: http://www.4-traders.com/NISSAN-MOTOR-CO-LTD-6492477/company/

Automarket. (2014, 6 9). *The Great Wall Automobile purchasing Geely Automobile 6AT*. Retrieved from Automarket Web site: http://www.automarket.net.cn/showfile.asp?code=051C4G8C4052C4G9056C4057C4G8C40540570H054C4G9057054G9056055C405H52054G8

Automotive Logistics. (2012, 10 1). *Boxing Clever*. Retrieved from Automotive Logistics Magazine Web site: http://www.automotivelogisticsmagazine.com/intelligence/boxing-clever

BYD. (2010, 6 1). *News*. Retrieved from BYD Web site: http://www.bydauto.com.cn/news.php?page=88

CAAM. (2010, 4 10). *Global Auto Production by Countries Districts) 2000*. Retrieved from China Association of Automobile Manufacturers Web Site: http://www.caam.org.cn/quanshijie/20100507/1005038908.html

CAAM. (2013, 1 25). *Top 10 Chinese Automobile Manufacturers in Exports in 2012*. Retrieved from China Association of Automobile Manufacturers Web Site: http://www.caam.org.cn/zhengche/20130125/1005086136.html

CAAM. (2014, 7 16). *Comprehensive data*. Retrieved from China Association of Auomobile Manufacturers Web Site: http://www.caam.org.cn/newslist/a190-4.html

CAAM. (2014, 7 16). *Global Automobile Production by Countries(Districts) 2013*. Retrieved from China Association of Automobile Manufacturers Web Site: http://www.caam.org.cn/zongheshuju/20140716/1005124690.html

CAAM. (2014, 1 21). *Top 10 Chineses Automobile Manufacturers in Sales in 2013*. Retrieved from China Association of Automobile Manufacturers Web site: http://www.caam.org.cn/zhengche/20140121/1405112765.html

CALA. (2013, 11 28). Review of Railway Ro-Ro Transportation. *CALA Circular*, pp. 16, 25.

China highway. (2011, 6 3). *the 12th Five-year Development Programme of Transportation of China*. Retrieved from China highway Web site: http://www.chinahighway.com/news/2011/530343.php

China Shipping. (n.d.). *Company Profile*. Retrieved 8 1, 2014, from China Shipping (Group) Company: http://www.cnshipping.com/en/aboutus/companyprofile/21399.shtml

China Shipping. (n.d.). *Global Network*. Retrieved 8 1, 2014, from China Shipping (Group) Company Web Site: http://www.cnshipping.com/en/GlobalNetwork/index.shtml

China.com. (2010, 8 22). *The history of Beijing Jeep Cooperation*. Retrieved from China.com Web site: http://auto.china.com/zh_cn/dongtai/renyi/11022368/20100822/16095385.html

Clarkson Rearch Services. (2014, 3 1). *PCC Fleet by Year of Built*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/tables/Default.aspx#

Clarkson Research Sercives. (2014, 7 14). *PCC Fleet by Size & Year of Delivery (Veh)*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/tables/Default.aspx#

Clarkson Research Service. (2014, 7 7). *2010 PCC Fleet by Year of Delivery & Vehicle Range*. Retrieved from Shipping Intelligence Network: http://www.clarksons.net/sin2010/tables/Default.aspx#

Clarkson Research Services. (2012). *Car Carrier Trade & Transport 2012.* Clarkson Research Services.

Clarkson Research Services. (2014). *Global Seaborne Car Trade*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/ts/Default.aspx

Clarkson Research Services. (2014, 8 1). *PCC (6500 cars cap) Newbuilding Prices*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/ts/Default.aspx

Clarkson Research Services. (2014, 7 13). *PCC (Veh) Orderbook by year*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/ts/Default.aspx

Clarkson Research Services. (2014, 9). *PCC FLEET*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/ts/Default.aspx

Clarkson Research Services. (2014, 7 7). *PCC Fleet by Year of Delivery & Vehicles Range*. Retrieved from Shiping Inteligengce Network 2010: http://www.clarksons.net/sin2010/tables/Default.aspx#

Clarkson Research Services. (2014, 7 7). *Pure Car Carrier Orderbook*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/register/Default.aspx?sValues=rOpt%3dorderbook%7crSel%3d3%7cZS0_SHIP_TYPE%3dVJ11%7ctitle%3dPure+Car+Carrier+Orderbook%7c

Clarkson Research Services. (2014). *Pure Car Carrier Register*. Retrieved from Shipping Intelligence Network 2010: http://www.clarksons.net/sin2010/register/Default.aspx?sValues=rOpt%3dregister%7crSel%3d3%7cZS0_SHIP_TYPE%3dVJ11%7ctitle%3dPure+Car+Carrier+Fleet%7c

Clarkson Research Services Limited. (2013). *Car Carrier Trand & Transport 2013.* London: Clarkson Research Services Limited.

CNSS. (2012, 8 10). *A Tale of Two Worlds in Car Carrier Shipping Market*. Retrieved from cnss Web site: http://www.cnss.com.cn/html/2012/domestic_industry_0810/74911.html

COSCO. (2006, 8 17). *COSCO Signed Strategic Cooperation Agreement with 17 Automobile Manufacturers in car shipping*. Retrieved from COSCO Web Site: http://www.cosco.com/art/2006/8/17/art_40_10027.html

COSCO. (n.d.). *Introduction*. Retrieved 8 8, 2014, from COSCO Web Site: http://en.cosco.com/col/col771/index.html

COSCOGZ. (2013). *Guidance for Implemention of the "lean management" to save fuel costs*. Retrieved from COSCO Guangzhou Wbe site: http://www.coscogz.com.cn/gzyy/jygl/FDZL/FDZL-2.htm

CSC Group. (2005). *The 11th Five-year Strategic Plan of CSC Group.* Unpublished.

CSCC. (2014). *Development Plan of CSCC.* Shanghai: Unpublished.

Cui, D. (2014, 2 7). *2013 China's Automobile Import and Exort Analysis.* Retrieved from auto.sohu Web site: http://auto.sohu.com/20140207/n394565752.shtml

DPCA. (2014). *Company Introduction*. Retrieved from DONGFENG PEUGEOT CITROEN AUTOMOBILE OMPANY LTD Web site: http://www.dpca.com.cn/dpca/publish/about.html

DPCA. (2014). *Historical Events of DPCA*. Retrieved from DPCA Web site: http://www.dpca.com.cn/dpca/publish/record-2014.html

DRCSC, SAE of China, Volkswagen Group China. (2013). *Annual Report on Automotive Industry in China (2013).* Social Sciences Academic Press (China).

EUKOR. (n.d.). *Fleet List*. Retrieved 8 1, 2014, from EUKOR Web Site: http://www.eukor.com/homepage/eukor/fleet_fleetlist.jsp

EUKOR. (n.d.). *Induction*. Retrieved 8 1, 2014, from EUKOR Web Site: http://www.eukor.com/homepage/eukor/about_introduction.jsp

EUKOR. (n.d.). *Service Routes*. Retrieved 8 1, 2014, from EUKOR Web Site: http://www.eukor.com/homepage/eukor/routes_overview.jsp

FAW-VW. (n.d.). *Company Briefs*. Retrieved from FAW-VW Web site: http://www.faw-vw.com/about

GASGOO. (2014, 3 7). *New-Energy Cars Development in China in 2013*. Retrieved from GASGOO Web site: http://auto.gasgoo.com/News/2014/03/060335543554602863955 68.shtml

GASGOO. (2014, 3 6). *Top Ten Global Auto Manufacture countries in 2013*. Retrieved from GASGOO Web site: http://auto.gasgoo.com/News/2014/03/060912481248602863014 56ALL.shtml

GEELY. (2014). *Historical Events of Geely*. Retrieved from GEELY Web site: http://www.geely.com/introduce/memorabilia/index.html

Guiqing Zhai, G. D. (2008). The Analysis of China's Ro-Ro Transportation development. *Modern Business Trade Industry*.

HONDA. (2014). *Annual Report 2014.* Honda Motor Co., Ltd.

K-LINE. (2013). *Annual Report 2013.* K-LINE.

K-LINE. (2013). *Social and Environmental Report 2013.* K-LINE.

K-LINE. (2014, 6). *Supplementary Report - Fiscal Year 2014* -. Retrieved from K-LINE Web site: http://www.kline.co.jp/en/ir/library/pr/__icsFiles/afieldfile/2014/07/30/2014_1_analyst_e.pdf

Liu, Y. (2014, 3 24). Marketing Plan for H Company. Malmo, Skane, Sweden: Unpublished.

MBALIB. (n.d.). *Peugeot Automobile Company*. Retrieved from MBALIB Web site: http://wiki.mbalib.com/wiki/%E6%A0%87%E8%87%B4%E6%B1%BD%E8%BD%A6%E5%85%AC%E5%8F%B8

Ministry of Commerce of the People's Republic of China. (2013, 12 9). *Company List of Permit for Automotive Products Export*. Retrieved from Ministry of Commerce of the People's Republic of China Web site: http://www.mofcom.gov.cn/article/b/e/201312/20131200417459.shtml

MOL. (2014). *MOL- CAR AND RORO*. Retrieved from MOL Web Site: http://www.molroro.com/Vessels.aspx

MOL. (2014). *Part I: the Car Carrier Story*. Retrieved from MOL Web site: http://www.mol.co.jp/ishin/en/carcarrier/past/

MOL. (n.d.). *Coperate Profile*. Retrieved 8 1, 2014, from MOL Web Site: http://www.mol.co.jp/en/corporate/profile/index.html

MOL. (n.d.). *Route Maps*. Retrieved 8 1, 2014, from MOL Web Site: http://www.molroro.com/DisplayRouteMapDetails.aspx

National Bureau of Statistics of China. (2014). *Annual Data*. Retrieved from National Bureau of Statistics of China Web site: http://data.stats.gov.cn/workspace/index;jsessionid=5F8E03FAB2A408760BFCD34B9F819F1E?m=hgnd

NYK. (2014). *NYK ECO SHIP 2030*. Retrieved from NYK Web site: http://www.nyk.com/english/csr/envi/ecoship/

NYK. (n.d.). *Car Transport*. Retrieved 8 1, 2014, from NYK Web Site: http://www.nyk.com/english/service/bulk/car/

NYK. (n.d.). *Profile*. Retrieved 8 1, 2014, from NYK Web Site: http://www.nyk.com/english/profile/profile/profile/

NYKCOS. (n.d.). *NYK Capacity*. Retrieved 8 1, 2014, from NYKCOS Web Site: http://www.nykcos.com/nykcosen/Yunli.aspx

OICA. (2013, 3). *WORLD RANKING OF MANUFACTURERS*. Retrieved from Organisation Internationale des Constructeurs d'Automobiles Web Site: http://www.oica.net/wp-content/uploads/2013/03/worldpro2012-modification-ranking.pdf

OICA. (n.d.). *Production Statistics*. Retrieved 7 10, 2014, from Organisation Internationale des Constructeurs d'Automobiles Web Site: http://www.oica.net/category/production-statistics/

OICA. (n.d.). *Vehidles in use*. Retrieved 8 1, 2014, from Organisation Internationale des Constructeurs d'Automobiles Web Site: http://www.oica.net/category/vehicles-in-use/

SAIC. (2014). *History of SAIC*. Retrieved from SAIC Web site: http://www.saicgroup.com/chinese/gsgk/sqfzs/index.shtml

SASAC. (n.d.). *Company List Owned by the State*. Retrieved 2014, from SASAC Web site: http://www.sasac.gov.cn/n1180/n1226/n2425/

SHANGHAI VOLKSWAGEN. (n.d.). *Company Introduction*. Retrieved from SHANGHIA VOLKSWAGEN Web site: http://www.csvw.com/csvw2011/qygk/qyjj/gsjs/index.shtml

SINATRANS&CSC. (n.d.). *Group Introduction*. Retrieved 2013, from SINATRANS&CSC Web site: http://www.sinotrans-csc.com/col/col206/index.html

SOHU. (2013, 12 4). *auto.sohu.com*. Retrieved from sohu: http://auto.sohu.com/20131204/n391226824.shtml

SOHU. (n.d.). *China's Automobile Industry in 60 Years*. Retrieved 2014, from auto.sohu: http://auto.sohu.com/s2013/chinacar60/

The World Bank. (2014). *GDP per capita (current US$)*. Retrieved from The World Bank Web Site: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

TOYOTA. (2014, 3 31). *Stock Overview*. Retrieved from TOYOTA Web site: http://www.toyota-global.com/investors/stock_information_ratings/outline.html

Wallenius Lines. (n.d.). *Our Fleet*. Retrieved 8 1, 2014, from Walleniuslines Wbe Site: http://www.walleniuslines.com/Fleet/Fleet-List1/

Wilh. Wilhelmsen Group. (n.d.). *COMPINES*. Retrieved 8 1, 2014, from Wilh. Wilhelmsen Group Web Site: http://www.wilhelmsen.com/services/wilhwilhelmsenasa/Pages/WilhWilhelmsenASA.aspx

Wilh. Wilhelmsen Group. (n.d.). *The Fleet*. Retrieved 8 1, 2014, from Wilh. Wilhelmsen Group Web Site: http://www.wilhelmsenasa.com/aboutus/ourbusiness/thefleet/Pages/thefleet.aspx

Wilh. Wilhelmsen. (n.d.). *Recent changes to fleet*. Retrieved 8 1, 2014, from Wilh. Wilhelmsen Web Site: http://www.wilhelmsenasa.com/aboutus/ourbusiness/thefleet/Pages/Newbuildings.aspx

WTO. (2014). *International Trade and Market Access Data: Automovile products*. Retrieved from WTO Web Site: http://www.wto.org/english/res_e/statis_e/statis_bis_e.htm?solution=WTO&path=/Dashboards/MAPS&file=Map.wcdf&bookmarkState={%22impl%22:%22client%22,%22params%22:{%22langParam%22:%22en%22}}

WTO. (2014). *International Trade and Market Access Data: Total merchandise*. Retrieved from WTO Web Site: http://www.wto.org/english/res_e/statis_e/statis_bis_e.htm?solution=WTO&path=/Dashboards/MAPS&file=Map.wcdf&bookmarkState={%22impl%22:%22client%22,%22params%22:{%22langParam%22:%22en%22}}

Zhang, Z. (2013, 8). *Too Late for Chinese Car Exports Exceeding 1 million*. Retrieved from China Ecomonic Weekly: http://paper.people.com.cn/zgjjzk/html/2013-03/04/content_1206738.htm?div=-1

Appendix A

China's Automobile Production between 2000 and 2013

Year	China's Automobile Production	Annual Growth Rate
2000	2069069	
2001	2334440	12.83%
2002	3286804	40.80%
2003	4443686	35.20%
2004	5234486	17.80%
2005	5708421	9.05%
2006	7188708	25.93%
2007	8882456	23.56%
2008	9299180	4.69%
2009	13790994	48.30%
2010	18264667	32.44%
2011	18418876	0.84%
2012	19271808	4.63%
2013	22116825	14.76%
Average Annual Growth Rate from 2000 to 2013		19.99%
Average Annual Growth Rate from 2009 to 2013		12.53%

Source: (CAAM, 2014)

Appendix B

China's Automobile Sales between 2005 and 2013

Year	China's Automobile Sales	Annual Growth Rate
2005	5,758,189	
2006	7,215,972	25.32%
2007	8,791,528	21.83%
2008	9,380,502	6.70%
2009	13,644,794	45.46%
2010	18,061,936	32.37%
2011	18,505,114	2.45%
2012	19,306,435	4.33%
2013	21,984,100	13.87%
Average Annual Growth Rate from 2005 to 2013		18.23%
Average Annual Growth Rate from 2009 to 2013		12.66%

Source: (CAAM, 2014)

Appendix C

Chinese Automotive Products Exports and Imports Value and Ratio

Year	Exports Value	Imports Value	Exports/Imports
1992	264.94	3,595.01	7.37%
1993	358.43	4,973.31	7.21%
1994	425.56	4,388.68	9.70%
1995	621.19	2,609.35	23.81%
1996	591.75	2,156.42	27.44%
1997	731.92	1,904.53	38.43%
1998	796.41	2,061.00	38.64%
1999	1,039.85	2,538.06	40.97%
2000	1,580.69	3,798.40	41.61%
2001	1,891.74	4,912.26	38.51%
2002	2,677.30	6,960.21	38.47%
2003	3,571.43	12,778.09	27.95%
2004	6,272.04	14,427.76	43.47%
2005	9,956.94	13,545.03	73.51%
2006	14,409.90	18,579.61	77.56%
2007	23,032.49	24,033.35	95.84%
2008	28,636.14	29,068.78	98.51%
2009	19,852.88	30,848.30	64.36%
2010	28,036.75	53,043.14	52.86%
2011	37,493.79	69,641.82	53.84%
2012	43,109.58	73,972.61	58.28%

Source: (WTO, 2014)

Appendix D

Chinese Automotive Products Exports Distribution

Continents	Areas	Exports					Growth Rate			
		2009	2010	2011	2012	2013	2010	2011	2012	2013
South America	South	16,807	52,318	82,921	87,194	120,918	211%	58%	5%	39%
	Middle West	10,042	25,379	45,955	58,030	68,726	153%	81%	26%	18%
	North	4,355	13,434	36,180	64,451	60,904	208%	169%	78%	-6%
	East	4,171	25,322	104,201	21,471	23,280	507%	312%	-79%	8%
Total		35,375	116,453	269,257	231,146	273,828	229%	131%	-14%	18%
Proportion		9.56%	20.58%	31.61%	22.75%	28.91%				
Asia	West	76,468	106,527	139,662	222043	131247	39%	31%	59%	-41%
	South East	45,665	56,253	60,757	60,684	70,924	23%	8%	0%	17%
	south	13,433	28,585	18,102	18,823	23,754	113%	-37%	4%	26%
	Middle	5,850	7,811	12,774	19,805	19,845	34%	64%	55%	0%
	East	7,294	15,739	20,630	19,066	18,602	116%	31%	-8%	-2%
Total		148,710	214,915	251,925	340,421	264,372	45%	17%	35%	-22%
Proportion		40.19%	37.97%	29.57%	33.51%	27.91%				
Africa	North	78,274	82,180	111,949	188,704	163,004	5%	36%	69%	-14%
	South	15,210	24,049	24,323	33,320	29,007	58%	1%	37%	-13%
	West	11,839	12,052	20,981	20,405	19,713	2%	74%	-3%	-3%
	East	4,692	4,883	8,815	13,010	9,736	4%	81%	48%	-25%
	Middle	3,008	2,698	4,294	3,108	5,171	-10%	59%	-28%	66%
Total		113,023	125,862	170,362	258,547	226,631	11%	35%	52%	-12%
Proportion		30.55%	22.24%	20.00%	25.45%	23.93%				
Europe	East	12,742	36,380	96,193	120,710	126,003	186%	164%	25%	4%
	Middle	19,045	14,878	14,024	14,235	8,240	-22%	-6%	2%	-42%
	South	11,140	16,447	11,185	8,158	4,870	48%	-32%	-27%	-40%
	West	2,736	5,262	6,813	4,333	3,782	92%	29%	-36%	-13%
	North	1,016	1,487	1,267	1,130	520	46%	-15%	-11%	-54%
Total		46,679	74,454	129,482	148,566	143,415	60%	74%	15%	-3%
Proportion		12.62%	13.16%	15.20%	14.62%	15.14%				
North America	North	13,375	15,238	4,551	10,204	17,896	14%	-70%	124%	75%
	Middle	1,011	2,290	3,528	4,714	5,234	127%	54%	34%	11%
	Caribbean	6,573	6,128	6,071	6,225	4,727	-7%	-1%	3%	-24%
Total		20,959	23,656	14,150	21,143	27,857	13%	-40%	49%	32%
Proportion		5.66%	4.18%	1.66%	2.08%	2.94%				
Australia		5,254	10,609	16,727	16,059	11,074	102%	58%	-4%	-31%
Proportion		1.42%	1.87%	1.96%	1.58%	1.17%				
Total		370,000	565,949	851,903	1,015,882	947,177	53%	51%	19%	-7%

Source: (Cui, 2014)

Appendix E

Global Automobile Production in 2000

Countries/Regions	Cars	Growth Rate	Commercial Vehicles	Growth Rate	Total	Growth Rate
Argentina	238921	6.31%	100711	25.77%	339632	11.42%
Australia	323649	15.01%	23473	9.14%	347122	14.59%
Austria	115979	-6.16%	25047	59.08%	141026	1.22%
Belgium	912233	-0.58%	121061	21.61%	1033294	1.60%
Brazil	1351998	22.05%	329519	35.56%	1681517	24.48%
Canada	1550500	-4.66%	1411136	-1.49%	2961636	-3.18%
China	604677	6.95%	1464392	15.80%	2069069	13.07%
Czech Republic	428224	22.88%	27268	-1.84%	455492	21.06%
Egypt	39616	-12.77%	20149	-34.22%	59765	-21.41%
Finland	38468	13.46%	458	-2.97%	38926	13.24%
France	2879810	3.42%	468551	18.40%	3348361	5.29%
Germany	5131918	-3.35%	394697	4.37%	5526615	-2.83%
Hungary	134029	6.47%	3369	46.67%	137398	7.19%
India	517957	-2.85%	283403	-0.58%	801360	-2.06%
Indonesia	257058	235.08%	35652	190.04%	292710	228.86%
Iran	274985	130.27%	3000	——	277985	132.78%
Italy	1422284	0.84%	316031	8.68%	1738315	2.18%
Japan	8359434	3.20%	1781362	-0.78%	10140796	2.48%
Malaysia	280283	17.77%	2547	-84.17%	282830	11.31%
Mexico	1279089	28.71%	656438	18.03%	1935527	24.88%
Netherlands	215085	-17.98%	52234	16.13%	267319	-12.99%
Poland	481689	-11.91%	23283	-16.82%	504972	-12.15%
Portugal	178509	-4.54%	68215	4.47%	246724	-2.21%
Romania	64181	-27.33%	13984	-24.75%	78165	-26.88%
Russia	969235	2.70%	236346	4.59%	1205581	3.07%
Serbia	11091	190.64%	1649	13.49%	12740	141.79%
Slovakia	181333	43.34%	450	37.20%	181783	43.33%
Slovenia	122949	4.08%	0	——	122949	4.08%
South Africa	230577	7.40%	126787	23.49%	357364	12.60%
Korea	2602008	10.17%	512990	6.57%	3114998	9.56%
Spain	2366359	3.71%	666515	16.77%	3032874	6.33%
Sweden	259959	21.54%	41384	12.31%	301343	20.18%
Taiwan	263013	-1.12%	109600	25.98%	372613	5.56%
Thailand	97129	52.87%	314592	21.36%	411721	27.56%
Turkey	297476	33.97%	133471	76.03%	430947	44.68%
Ukraine	18124	78.81%	13131	45.19%	31255	62.96%
United Kingdom	1641452	-8.13%	172442	-7.73%	1813894	-8.09%
USA	5542217	-1.70%	7257640	-1.75%	12799857	-1.73%
Uzbekistan	32273	-27.37%	0	——	32273	-27.37%
Others	127445	46.74%	63204	92.69%	190649	59.34%
Total	41215653	3.66%	17158509	4.00%	58374162	3.76%

Source: (CAAM, 2010)

Appendix F

Global Automobile Production in 2013

Countries/Regions	Cars	Growth Rate	Commercial Vehicles	Growth Rate	Total	Growth Rate
Argentina	506,539	1.84	284,468	6.49	791,007	3.50%
Australia	185,427	3.89	30,499	-2.40	215,926	-4.70%
Austria	148,320	19.61	22,900	20.15	171,220	20.00%
Belgium	449,600	-11.36	30,564	-11.84	480,164	-10.80%
Brazil	2,742,309	4.52	998,109	38.84	3,740,418	9.90%
Canada	965,191	-7.22	1,414,615	-0.62	2,379,806	-3.40%
China	18,085,213	16.50	4,031,612	7.56	22,116,825	14.80%
Czech Rep.	1,128,473	-3.70	4,458	-37.77	1,132,931	-3.90%
Egypt	25,650	-30.45	13,400	-31.63	39,050	-30.90%
Finland	3,330	14.83	0	N/A	3,330	14.80%
France	1,460,000	-13.24	280,000	-1.74	1,740,000	-11.60%
Germany	5,439,904	0.95	278,318	6.71	5,718,222	1.20%
Hungary	220,000	2.12	2,400	0.00	222,400	2.10%
India	3,138,988	-4.46	741,950	-13.70	3,880,938	-7.00%
Indonesia	925,111	24.43	283,100	-12.10	1,208,211	13.40%
Iran	630,639	-25.63	113,041	-19.89	743,680	-25.60%
Italy	388,465	-2.10	269,742	-1.89	658,207	-2.00%
Japan	8,189,323	-4.27	1,440,747	3.76	9,630,070	-3.10%
Malaysia	540,200	5.84	55,970	-9.36	596,170	4.70%
Mexico	1,771,987	-2.10	1,280,408	7.42	3,052,395	1.70%
Netherlands	0	-100.00	0	-100.00	0	-100.00%
Poland	475,000	-12.04	108,258	0.42	583,258	-10.90%
Portugal	109,698	-5.22	44,318	-7.33	154,016	-5.80%
Romania	410,959	25.85	38	-99.66	410,997	21.70%
Russia	1,919,636	-2.50	255,675	-2.77	2,175,311	-2.60%
Serbia	10,100	-1.24	805	1.13	10,905	-1.20%
Slovakia	975,000	8.33	0	N.A.	975,000	5.20%
Slovenia	89,395	-29.52	4,339	5.49	93,734	-28.40%
South Africa	265,257	-3.50	280,656	6.09	545,913	1.20%
South Korea	4,122,604	-1.07	398,825	2.09	4,521,429	-0.90%
Spain	1,719,700	11.69	443,638	0.94	2,163,338	9.30%
Sweden	161,080	-1.07	N.A.	N.A.	161,080	-1.10%
Taiwan	291,037	4.67	47,683	-21.82	338,720	-0.10%
Thailand	1,122,780	17.25	1,409,797	-7.58	2,532,577	4.30%
Turkey	633,604	9.87	491,930	-0.76	1,125,534	4.90%
Ukraine	45,758	-34.34	4,691	-28.86	50,449	-33.90%
UK	1,509,762	3.06	87,671	-21.75	1,597,433	1.30%
USA	4,346,958	5.87	6,698,944	7.65	11,045,902	6.90%
Uzbekistan	133,740	-7.75	21,020	9.48	154,760	-5.70%
Others	474,188	12.16	127,950	-2.62	602,138	0.40%
Total	**65,433,287**	3.75	**21,866,828**	3.77	**87,300,115**	**3.70%**

Source: (CAAM, 2014)

Appendix G

Global Automobile Production between 2000 and 2013

Year	Production	Annual Growth Rate
2000	58,374,162	
2001	56,304,925	-3.54%
2002	58,994,318	4.78%
2003	60,663,225	2.83%
2004	64,496,220	6.32%
2005	66,482,439	3.08%
2006	69,222,975	4.12%
2007	73,266,061	5.84%
2008	70,520,493	-3.75%
2009	60,986,985	-13.52%
2010	77,703,987	27.41%
2011	80,107,564	3.09%
2012	84,141,209	5.04%
2013	87,300,115	3.75%
Average Annual Growth Rate		**3.14%**

Source: (CAAM, 2014)

Appendix H

Global Automobile Sales between 2005 and 2013

Year	Total	Annual Growth Rate	Europe	Annual Growth Rate	America	Annual Growth Rate	Asia/ Australia/ Middle East	Annual Growth Rate	Africa	Annual Growth Rate
2005	65,431,687		21,141,298		23,276,227		19,878,503		1,135,659	
2006	68,021,580	**3.96%**	21,972,212	3.93%	23,287,602	0.05%	21,423,412	7.77%	1,338,354	17.85%
2007	71,192,619	**4.66%**	23,075,368	5.02%	23,546,381	1.11%	23,220,428	8.39%	1,350,442	17.85%
2008	68,076,216	**-4.38%**	21,923,546	-4.99%	20,854,880	-11.43%	24,012,039	3.41%	1,285,751	0.90%
2009	65,415,240	**-3.91%**	18,661,876	-14.88%	17,494,287	-16.11%	28,071,003	16.90%	1,188,074	-4.79%
2010	74,628,515	**14.08%**	18,799,111	0.74%	19,655,177	12.35%	34,897,706	24.32%	1,276,521	-7.60%
2011	77,926,946	**4.42%**	19,731,905	4.96%	21,499,758	9.38%	35,304,821	1.17%	1,390,462	7.44%
2012	82,181,131	**5.46%**	18,655,874	-5.40%	23,673,029	10.11%	38,242,735	8.32%	1,599,493	15.03%
2013	85,488,553	**4.02%**	18,282,465	-2.05%	25,003,803	5.62%	40,549,227	6.03%	1,653,058	3.35%
Average Annual Growth Rate		**3.40%**	-1.80%		0.90%		9.32%		4.80%	

Source: (CAAM, 2014)

Appendix I

Value of Global and Chinese Automotive Products Exports

Year	Global Automotive products Exports	Total Merchandise Trade	Automotive Exports/ Total Merchandise	Chinese Automotive Products Exports	Chinese Automotive Exports/ Global Automotive Exports
	million U.S. Dollars	million U.S. Dollars	%	million U.S. Dollars	%
1980	131800	2036000	6.47%	63.00	0.05%
1990	318959	3490000	9.14%	258.00	0.08%
1991	324868	3512000	9.25%	411.00	0.13%
1992	361408	3782000	9.56%	264.94	0.07%
1993	349220	3791000	9.21%	358.43	0.10%
1994	401043	4328000	9.27%	425.56	0.11%
1995	459187	5168000	8.89%	621.19	0.14%
1996	481952	5407000	8.91%	591.75	0.12%
1997	501855	5592000	8.97%	731.92	0.15%
1998	529344	5503000	9.62%	796.41	0.15%
1999	556420	5715000	9.74%	1,039.85	0.19%
2000	576434	6457000	8.93%	1,580.69	0.27%
2001	569002	6195000	9.18%	1,891.74	0.33%
2002	627866	6495000	9.67%	2,677.30	0.43%
2003	729650	7589000	9.61%	3,571.43	0.49%
2004	858085	9223000	9.30%	6,272.04	0.73%
2005	920376	10508000	8.76%	9,956.94	1.08%
2006	1018517	12130000	8.40%	14,409.90	1.41%
2007	1192067	14022000	8.50%	23,032.49	1.93%
2008	1231673	16159000	7.62%	28,636.14	2.32%
2009	844010	12554000	6.72%	19,852.88	2.35%
2010	1091580	15300000	7.13%	28,036.75	2.57%
2011	1284494	18327000	7.01%	37,493.79	2.92%
2012	1295298	18404000	7.04%	43,109.58	3.33%

Source: (WTO, 2014; WTO, 2014)

Appendix J

WORLD MOTOR VEHICLE PRODUCTION
OICA correspondents survey

WORLD RANKING OF MANUFACTURERS

Year 2012

Rank	GROUP	Total	CARS	LCV	HCV	HEAVY BUS
1	TOYOTA	10,104,424	8,381,968	1,448,107	268,377	5,972
2	G.M.	9,285,425	6,608,567	2,658,612	7,558	10,688
3	VOLKSWAGEN	9,254,742	8,576,964	486,544	169,064	22,170
4	HYUNDAI	7,126,413	6,761,074	279,579	70,290	15,470
5	FORD	5,595,483	3,123,340	2,394,221	77,922	
6	NISSAN	4,889,379	3,830,954	1,022,974	35,451	
7	HONDA	4,110,857	4,078,376	32,481		
8	PSA	2,911,764	2,554,059	357,705		
9	SUZUKI	2,893,602	2,483,721	409,881		
10	RENAULT	2,676,226	2,302,769	373,457		
11	CHRYSLER	2,371,427	656,892	1,702,235	12,300	
12	DAIMLER AG	2,195,152	1,455,650	257,496	450,622	31,384
13	FIAT	2,127,295	1,501,979	498,984	85,513	40,819
14	B.M.W.	2,065,477	2,065,216	261		
15	SAIC	1,783,548	1,523,398	190,848	67,805	1,497
16	TATA	1,241,239	744,067	314,399	165,171	17,602
17	MAZDA	1,189,283	1,097,661	91,622		
18	DONGFENG MOTOR	1,137,950	539,845	245,641	337,545	14,919
19	MITSUBISHI	1,109,731	980,001	127,435	2,295	
20	CHANGAN	1,063,721	835,334	166,727	59,978	1,682
21	GEELY	922,906	922,906			
22	FUJI	753,320	734,959	18,361		
23	BAIC	720,828	83,033	285,081	348,659	4,055
24	FAW	706,012	480,443	52,983	168,793	3,793
25	GREAT WALL	624,426	487,704	136,722		
26	MAHINDRA	606,418	429,101	173,083	3,461	773
27	ISUZU	600,470		32,309	565,617	2,544
28	CHERY	563,951	550,565	13,386		
29	AVTOVAZ	553,232	553,232			
30	BRILLIANCE	489,770	231,527	231,862	26,381	
31	JAC	476,356	200,278	114,864	145,811	15,403
32	BYD	455,444	455,444			
33	CHONGQING LIFAN MOTOR CO.	272,657	183,750	24,035	64,872	
34	VOLVO	234,680			224,000	10,680
35	PROTON	162,455	134,934	27,521		
36	CHINA NATIONAL HEAVY DUTY TRUCK	127,792		1,224	125,792	776
37	PACCAR	125,336			125,336	
38	GAZ	125,319		88,899	21,561	14,859
39	ASHOK LEYLAND	117,738		30,776	61,519	25,443
40	HUNAN JIANGNAN AUTOMOBILE MANUFACTURING CO.	117,051	117,051			
41	GUANGZHOU AUTO INDUSTRY	114,157	87,408	25,611		1,138
42	SHANNXI	86,283	8,044	166	77,808	265
43	PORSCHE	86,083	86,083			
44	SOUTH EAST (FUJIAN)	85,515	81,512	4,003		
45	NAVISTAR	83,371			72,005	11,366
46	XIAMEN KING LONG	78,226		36,451		41,775
47	UAZ	70,434	32,469	37,965		
48	TANGJUN OU LING	69,167		16,459	52,708	
49	HEBEI ZHONGXING	63,221	4,955	58,266		
50	SICHUAN NANJUN	60,743		18,296	41,602	845

Source: (OICA, 2013)

Appendix K

Global Seaborne Car Trade

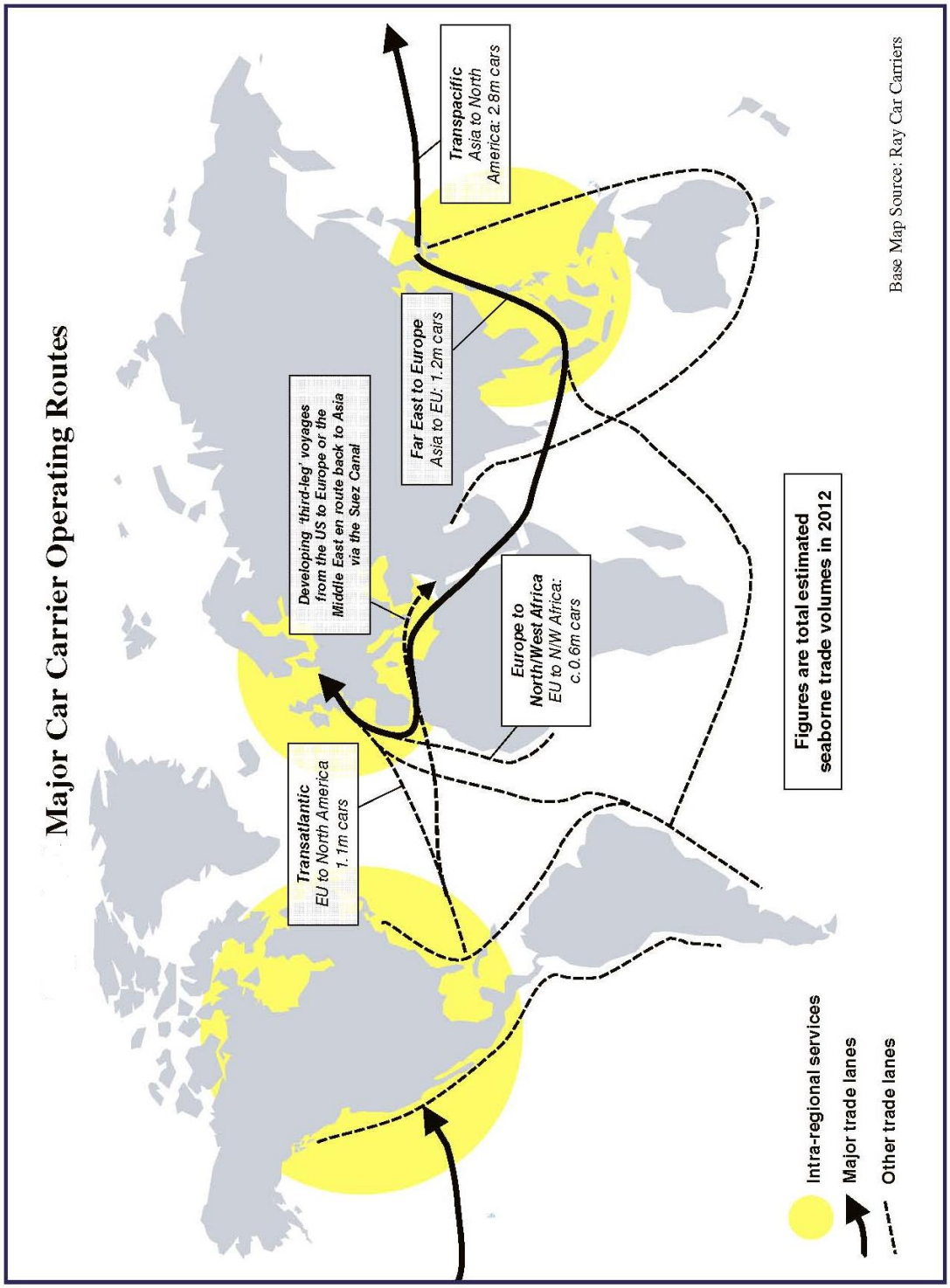
000 vehicles	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Imports																		
USA	1,849	2,122	2,273	2,863	3,297	3,379	3,780	3,686	3,898	3,994	4,529	4,486	4,027	2,481	3,052	3,036	3,615	3,655
Canada	227	312	292	347	481	905	552	520	492	506	582	606	656	541	581	540	646	628
EU	1,549	1,97	2,147	2,327	2,051	2,029	2,506	2,912	2,493	2,614	3,155	3,386	2,959	2,276	2,204	2,329	2,131	2,013
China	64	35	27	27	34	63	116	156	164	158	222	305	398	415	795	1,017	1,118	1,059
Malaysia	234	249	165	276	386	337	369	317	303	376	352	314	231	335	456	401	350	293
Japan	273	275	277	262	286	291	291	283	290	286	283	295	232	147	233	276	336	347
Brazil	334	254	269	303	336	369	328	288	247	206	165	246	377	418	614	863	638	606
Australia	308	369	431	416	455	467	488	538	566	649	704	752	749	611	825	732	860	928
Argentina	156	157	276	105	87	58	22	77	173	218	251	322	390	259	418	538	464	571
Russia	18	26	36	51	72	114	138	202	344	562	704	1,066	1,312	344	459	440	522	421

000 vehicles	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Exports																		
Japan	3,401	4,190	4,320	4,443	4,503	4,292	4,956	5,066	5,310	5,595	6,591	7,210	7,282	3,803	5,037	4,676	5,070	4,882
EU	1,724	1,881	2,037	2,194	2,508	2,623	2,892	2,813	3,283	3,330	3,557	3,987	3,648	2,477	3,434	4,185	5,039	5,224
South Korea	1,324	1,35	1,542	2,347	1,936	1,791	1,789	2,013	2,785	2,893	3,025	3,222	3,096	2,432	2,862	3,263	3,348	3,166
North America	825	738	773	631	666	742	1,018	1,501	1,927	2,386	2,430	3,111	3,495	2,171	2,177	2,509	2,769	2,765
China	2	3	2	1	5	9	33	96	344	964	1,440	1,618	1,106	635	796	1,007	1,114	1,098
India	38	30	26	21	24	18	32	112	182	231	286	327	442	635	921	1,018	835	978
Thailand	3	6	9	22	60	104	54	119	147	284	556	635	719	564	887	648	598	805
Turkey	8	16	32	75	84	152	167	227	321	340	441	503	534	458	486	499	487	575
Brazil	120	158	221	195	268	323	338	431	544	654	590	527	473	313	428	435	349	473
South Africa	195	195	345	303	588	592	595	272	386	500	250	153	287	161	209	213	170	173

Source: (Clarkson Research Services, 2014)

Appendix L

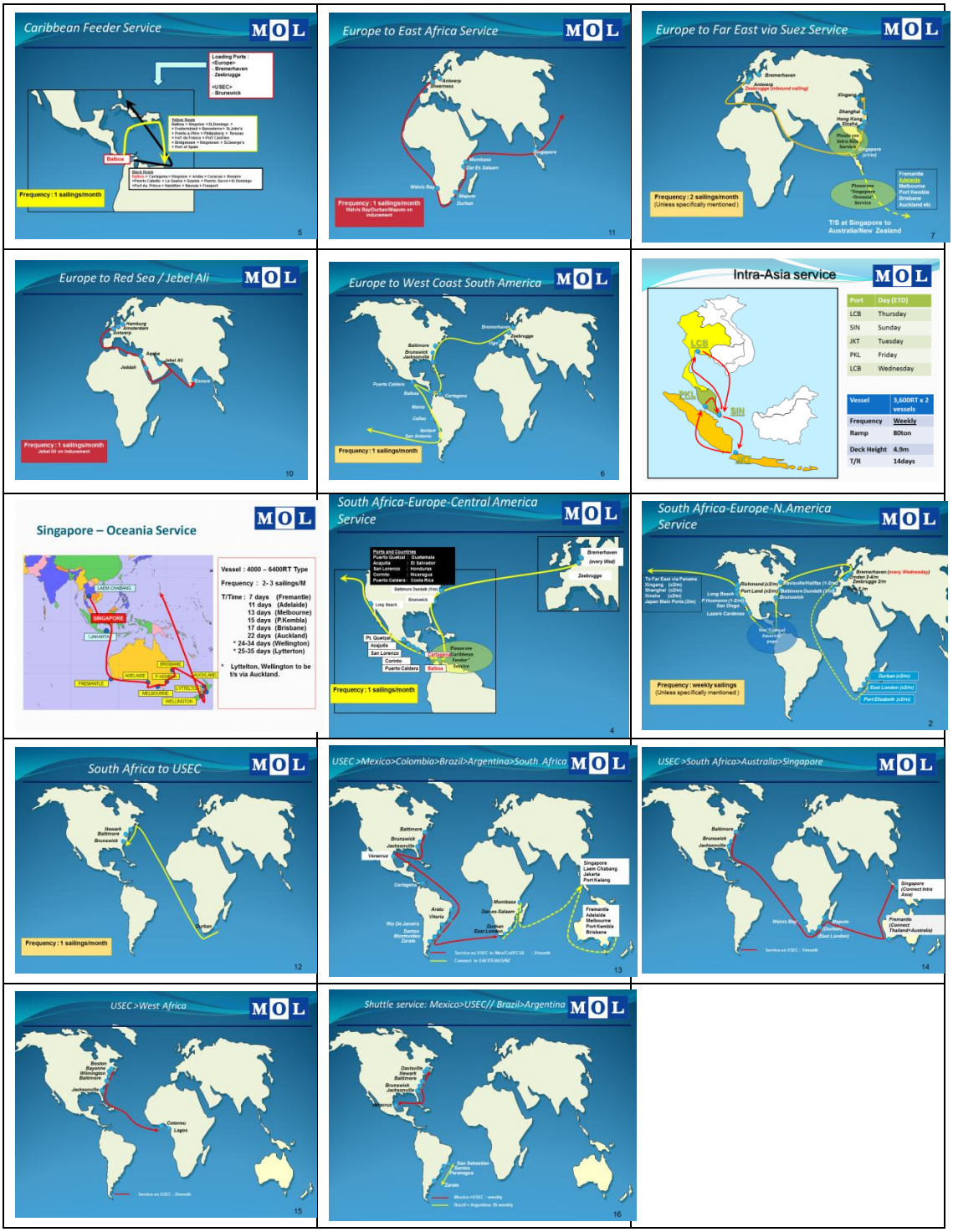
Major Car Operation Routes



Source: (Clarkson Research Services Limited, 2013)

Appendix M

Services Routes of MOL



Source: (MOL)

Appendix N

Proportion of Major Seaborne Car Export Area

%	EU Seaborne Car Exports	North America Seaborne Car Exports	Total EU and North America Export	Japan Seaborne Car Export	South Korea Seaborne Car Export	Total Japan and South Korea Export	Total Export
1996	21.54	10.31	31.85	42.5	16.55	59.05	90.9
1997	20.98	8.23	29.21	46.74	15.08	61.82	91.03
1998	20.97	7.95	28.92	44.46	15.87	60.33	89.25
1999	20.6	5.92	26.52	41.7	22.03	63.73	90.25
2000	22.38	5.94	28.32	40.18	17.27	57.45	85.77
2001	23.14	6.55	29.69	37.86	15.8	53.66	83.35
2002	22.93	8.08	31.01	39.31	14.19	53.5	84.51
2003	20.91	11.16	32.07	37.66	14.96	52.62	84.69
2004	20.21	11.86	32.07	32.69	17.14	49.83	81.9
2005	18.26	13.08	31.34	30.68	15.86	46.54	77.88
2006	17.64	12.05	29.69	32.68	15	47.68	77.37
2007	17.75	13.85	31.6	32.09	14.34	46.43	78.03
2008	16.34	15.65	31.99	32.61	13.86	46.47	78.46
2009	17.09	14.98	32.07	26.24	16.78	43.02	75.09
2010	18.85	11.95	30.8	27.65	15.71	43.36	74.16
2011	21.38	12.82	34.2	23.89	16.68	40.57	74.77
2012	24.09	13.24	37.33	24.24	16	40.24	77.57
2013	24.35	12.89	37.24	22.76	14.76	37.52	74.76

Source: (Clarkson Research Services, 2014)

Appendix O

The EU, US and Canada Seaborne Car Imports and Proportion During 1996 and 2013

Date	EU Seaborne Car Imports ,000 Cars	EU Seaborne Car Imports Proportion %	US and Canada Seaborne Car Imports ,000 Cars	US and Canada Seaborne Car Imports Proportion %	Total Import Proportion %
1996	1,548.84	19.36	2,076.56	25.95	45.31
1997	1,971.57	21.99	2,433.13	27.15	49.14
1998	2,147.46	22.10	2,564.88	26.40	48.50
1999	2,327.01	21.84	3,209.50	30.13	51.97
2000	2,051.04	18.30	3,778.43	33.71	52.01
2001	2,028.53	17.89	4,284.12	37.79	55.68
2002	2,506.03	19.87	4,331.90	34.36	54.23
2003	2,911.64	21.64	4,206.06	31.27	52.91
2004	2,492.56	15.34	4,389.34	27.02	42.36
2005	2,614.46	14.34	4,499.83	24.68	39.02
2006	3,155.43	15.64	5,110.99	25.34	40.98
2007	3,386.29	15.07	5,091.66	22.66	37.73
2008	2,959.41	13.25	4,682.61	20.97	34.22
2009	2,276.46	15.71	3,021.91	20.85	36.56
2010	2,203.68	12.10	3,633.33	19.94	32.04
2011	2,328.96	11.90	3,576.16	18.27	30.17
2012	2,130.56	10.18	4,260.92	20.37	30.55
2013	2,013.43	9.38	4,282.99	19.96	29.34

Source: (Clarkson Research Services, 2014)

Appendix P

PCC Fleet Development

Vehicle Capacity											
Start	<2000		2,000-3,999		4,000-5,999		>6,000		Total		Y-o-y
	N0.	000 Cars	N0.	000 Cars	N0.	000 Cars	N0.	000 Cars	N0.	000 Cars	Growth
1996	96	74.7	115	346	165	820.3	23	90.7	399	1331.7	
1997	95	74.7	114	342.4	167	830	27	118.1	403	1365.2	2.5%
1998	98	78.6	114	342.4	171	849.3	31	145.7	414	1416.0	3.7%
1999	100	82.5	115	348.3	177	880.1	38	194.9	430	1505.8	6.3%
2000	107	90.9	117	355.1	188	935.2	50	275.5	462	1656.7	9.9%
2001	107	92.5	120	364.5	200	994.6	58	326.2	485	1777.8	7.3%
2002	105	93.3	118	360.1	203	1007.7	62	350.2	488	1811.3	1.9%
2003	109	97.5	116	354.2	208	1031.2	67	381.4	500	1864.3	2.9%
2004	109	98.8	114	349.6	213	1055.7	77	446.9	513	1951.0	4.7%
2005	109	98.9	115	353.5	217	1077.2	93	554.2	534	2083.8	6.8%
2006	110	100.8	120	368.6	225	1116.3	113	683.8	568	2269.5	8.9%
2007	112	103.2	123	378.6	236	1166	136	832.9	607	2480.7	9.3%
2008	113	106	127	391.2	251	1240.3	163	1010.8	654	2748.3	10.8%
2009	113	105.2	129	398.4	265	1308.7	207	1303.2	714	3115.5	13.4%
2010	107	98.7	97	306.6	230	1140.4	228	1455.7	662	3001.4	-3.7%
2011	104	97.8	100	314.3	235	1160.8	244	1602.7	683	3175.6	5.8%
2012	105	99.9	101	316.3	241	1187.9	277	1832.6	724	3436.7	8.2%
2013	100	95.3	102	318.8	246	1210.1	301	1990.7	749	3614.9	5.2%
2014					238	1172.9	318	2099.9	756	3662.5	1.3%
Compound average growth rates:											
1996-00	2.7%	5.0%	0.4%	0.7%	3.3%	3.3%	21.4%	32.0%	3.7%	5.6%	
2000-05	0.5%	2.1%	-0.4%	-0.1%	3.7%	3.6%	16.8%	19.1%	3.7%	5.9%	
2005-10	-0.5%	-0.1%	-3.5%	-3.5%	1.5%	1.4%	25.1%	27.3%	5.5%	9.5%	
2010-13	-2.2%	-1.2%	1.3%	1.3%	2.3%	2.0%	9.7%	11.0%	4.2%	6.4%	

Source: (Clarkson Research Services Limited, 2013)

Note: Fleet as at the start of year

Appendix Q

PCC Fleet by Year of Delivery & Vehicle Range

Year of Deliv-ery	Number of Vehicles													
	< 1,000		1,000 - 2,999		3,000 - 3,999		4,000 - 4,999		5,000 - 5,999		6,000 & Over		Total	
	No.	Veh.Cap	No.	Veh.Cap	No.	Veh.Cap	No.	Veh.Cap	No.	Veh.Cap	No.	Veh.Cap	**No.**	**Veh.Cap**
<= 1980	3	1,688	-	-	-	-	-	-	-	-	-	-	**3**	**1,688**
1981	-	-	1	1,000	-	-	-	-	1	5,235	-	-	**2**	**6,235**
1982	1	800	2	4,100	-	-	-	-	2	10,469	-	-	**5**	**15,369**
1983	1	750	1	1,082	5	15,581	-	-	-	-	-	-	**7**	**17,413**
1984	2	1,052	1	2,026	-	-	4	18,578	1	5,410	-	-	**8**	**27,066**
1985	1	300	4	9,269	3	10,230	1	4,860	7	38,116	-	-	**16**	**62,775**
1986	4	1,761	-	-	-	-	3	13,540	2	11,480	-	-	**9**	**26,781**
1987	1	533	3	7,718	6	21,821	8	36,952	6	33,117	3	18,200	**27**	**118,341**
1988	1	340	-	-	-	-	4	17,994	4	22,200	2	12,880	**11**	**53,414**
1989	6	3,284	-	-	-	-	1	4,049	1	5,630	-	-	**8**	**12,963**
1990	2	1,211	-	-	-	-	-	-	1	5,578	1	6,340	**4**	**13,129**
1991	4	2,760	1	1,536	-	-	-	-	1	5,905	-	-	**6**	**10,201**
1992	8	4,475	-	-	2	7,600	2	8,719	3	17,000	-	-	**15**	**37,794**
1993	4	3,370	-	-	-	-	3	13,559	2	10,730	1	6,400	**10**	**34,059**
1994	3	1,814	3	3,664	-	-	7	30,336	4	21,603	1	6,400	**18**	**63,817**
1995	-	-	1	1,550	-	-	3	13,676	5	27,077	2	12,980	**11**	**55,283**
1996	-	-	1	1,000	-	-	1	4,000	1	5,730	3	21,006	**6**	**31,736**
1997	-	-	4	5,412	-	-	3	13,570	2	11,603	3	19,245	**12**	**49,830**
1998	1	830	3	4,320	3	10,400	3	13,045	5	28,028	6	42,034	**21**	**98,657**
1999	6	4,909	5	7,395	3	10,656	4	17,320	7	37,714	12	80,730	**37**	**158,724**
2000	1	850	4	6,724	5	17,477	4	17,400	11	57,362	9	58,499	**34**	**158,312**
2001	2	1,281	4	6,668	1	3,343	3	13,136	-	-	4	24,030	**14**	**48,458**
2002	1	630	4	5,520	-	-	3	13,268	2	10,200	5	31,130	**15**	**60,748**
2003	1	681	2	2,813	-	-	-	-	2	10,758	10	65,388	**15**	**79,640**
2004	1	603	-	-	1	3,930	1	4,632	4	21,534	16	107,375	**23**	**138,074**
2005	-	-	3	6,114	3	10,860	4	18,136	4	20,926	20	129,593	**34**	**185,629**
2006	1	588	2	3,982	2	7,823	10	44,672	1	5,036	23	149,121	**39**	**211,222**
2007	-	-	3	5,347	4	13,786	8	37,074	7	37,217	27	177,842	**49**	**271,266**
2008	1	635	1	2,003	4	15,058	11	50,800	5	26,125	44	292,388	**66**	**387,009**
2009	2	1,358	4	9,000	9	32,079	7	33,472	13	67,446	27	178,652	**62**	**322,007**
2010	-	-	10	20,582	8	28,369	12	55,417	7	36,561	22	147,038	**59**	**287,967**
2011	-	-	7	13,721	4	15,554	7	31,604	3	15,007	34	229,897	**55**	**305,783**
2012	2	1,629	2	4,000	-	-	8	36,275	-	-	24	157,078	**36**	**198,982**
2013	1	825	1	1,100	-	-	-	-	-	-	18	118,838	20	**120,763**
Total	**61**	**38,957**	**77**	**137,646**	**63**	**224,567**	**125**	**566,084**	**114**	**610,797**	**317**	**2,093,084**	**757**	**3,671,135**

Source: (Clarkson Research Services, 2014)

Appendix R

Car Carrier Supply and Demand

Year	PCC Fleet (,000 cars)		Global Seaborne Car Trade (,000 cars)		Supply/ Demand
Start	Capacity	Growth Rate	Volume	Growth Rate	Ratio
1998	1416.0	3.7%	8963.82	12.0%	15.80%
1999	1505.8	6.3%	9715.90	8.4%	15.50%
2000	1656.7	10.0%	10653.55	9.7%	15.55%
2001	1777.8	7.3%	11206.83	5.2%	15.86%
2002	1811.3	1.9%	11336.33	1.2%	15.98%
2003	1864.3	2.9%	12609.06	11.2%	14.79%
2004	1951.0	4.7%	13452.88	6.7%	14.50%
2005	2083.8	6.8%	16244.16	20.7%	12.83%
2006	2269.5	8.9%	18238.02	12.3%	12.44%
2007	2480.7	9.3%	20169.93	10.6%	12.30%
2008	2748.3	10.8%	22469.08	11.4%	12.23%
2009	3115.5	13.4%	22330.34	-0.6%	13.95%
2010	3001.4	-3.7%	14490.13	-35.1%	20.71%
2011	3175.6	5.8%	18218.23	25.7%	17.43%
2012	3436.7	8.2%	19570.05	7.4%	17.56%
2013	3614.9	5.2%	20920.01	6.9%	17.28%
2014	3662.5	1.3%	21455.26	2.6%	17.07%
Average Growth Rate		5.98%		5.97%	

Source: (Clarkson Research Services Limited, 2013; Clarkson Research Services, 2014)

Note: at the start of the year