

A Comparative Study of Maritime Operations in India

by

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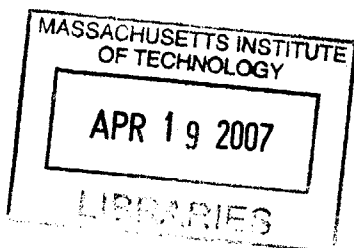
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Abstract

This thesis studies the maritime sector of India, specifically using China as a basis for comparison. Chinese economic impact is studied under the two major headings: the effective use of *non-living* and *living* resources. Next, an overview of the current maritime profile of India is presented followed by a comparative discussion to understand the reasons for India to lag behind China in the maritime field.

The outlook for global shipping, taking into account the possibility of strong economic growth in India, is presented. This is performed by comparing the expected impact on global shipping due to India, to the one observed in 2004 due to China. This comparative analysis foresees a plausible shipping boom in select cargo types namely liquid and dry bulk cargo. No boom in containers shipping is expected. Conditions of expected global shipping growth rates and Indian growth rates which may yield another shipping boom are presented.

Thesis Supervisor: Henry S. Marcus

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Dedicated to my Grandmother Smt. Narayani Amma.

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This thesis is the culmination of two years of my work at MIT in a discipline previously unknown to me. I recognize that this learning experience is just a formal introduction to the more informal experience called life. At this point I would like to thank so many people without whose help this thesis would never have been possible.

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Chapter 1

Introduction

1.1 Motivation

Both India and China have a continuous and a rich history dating back many thousands of years. Many historians agree that for most of the recorded human history, China and India had higher standards of living, were technologically advanced and were the richest nations on earth [26]. However, they both missed the rapid industrialization which occurred in Europe during the 18th and 19th century. Early 19th century saw the economic, scientific and political decline of both the countries and by the mid 20th centuries they were both classified as poor countries. Refer Figure 1-1 for a depiction of the historical trends in global GDP [26].

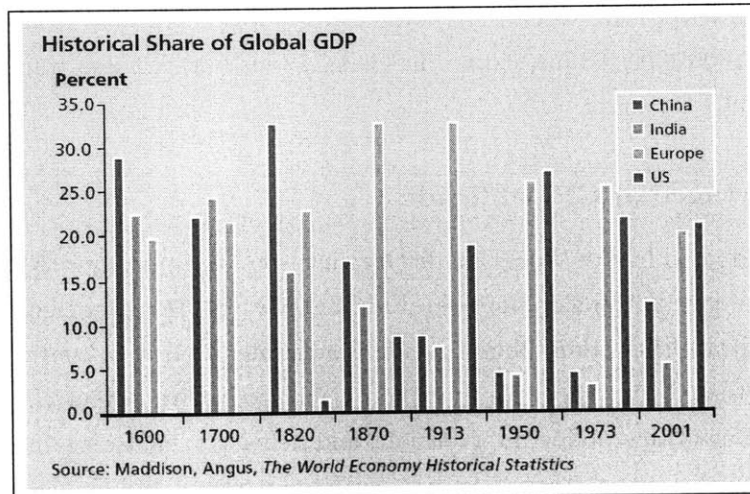


Figure 1-1: Historical Share of Global GDP [26].

Modern India gained its independence from Great Britain on August 15, 1947, while

modern China came into existence as a sovereign republic on January 1, 1912. The current People's Republic of China (PRC) was established on October 1, 1949. While India adopted a federal parliamentary democratic form of government, China adopted a Communist regime. However, both countries had been inspired by the success of USSR and followed a socialist path. At this point both were viewed as newly established developing nations with many similar attributes:

- Living resources (human resources)
- Abundance of natural resources
- Financial resources

Starting from 1978 economic reforms were initiated in China while India continued its protectionist policy for another decade till 1991, when reform processes were introduced. In 1982, China's per-capita GDP (in nominal dollars) of US\$275 was marginally lower than India's US\$280.

Economic liberalization at home and globalization abroad triggered massive rise in trade in both China and India. Decades of sustained high growth for China and India made them key players in the global economy for the first time in two centuries. Since they account for a bulk of the global economic growth, China and India could determine the global economic cycles (eg: shipping, energy, commodities).

However by 2005, China's share in global exports (US\$764) billion is nearly 7.6 times India's (US\$96 billion) [26]. China has been able to accelerate the process of integration into the global economy at a much faster pace than India. By 2005, China's per capita income (per capita GDP in purchasing power parity) was US\$6,800, more than twice that of India's US\$3,300 [30]. China's share in global goods and services trade has vaulted to 5.2%, against 0.9% for India.

1.1.1 Importance of Global Trade

A study conducted by the World Trade Organization [38] points out that though there is no simple one-to-one relationship between trade and poverty. However they were able to find evidences to indicate that trade liberalization is generally a positive contributor to poverty alleviation and that it allows people to exploit their productive potential, assists economic growth, curtails arbitrary policy interventions and helps to insulate against shocks.

Jan Hoffmann points out that the trade, economic growth and expenditure on international transport are all interrelated. And this growth in international trade is associated with an even higher growth in transportation related services (Figure 1-3). Further Ben-David *et. al.* [38] points out that export and import relations seem to facilitate income

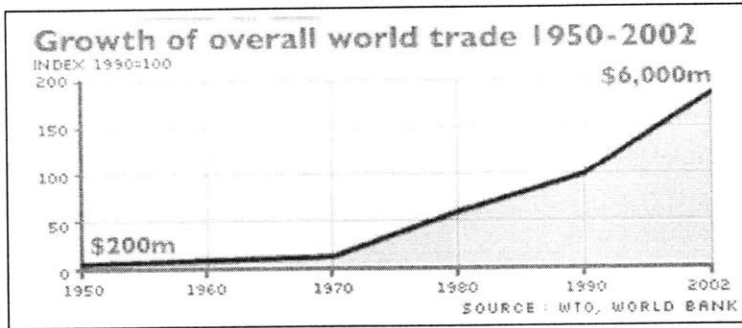


Figure 1-2: Growth of world trade [7].

convergence at roughly equal rates. Moreover, the rate of income convergence increases with the bilateral trade volume. Thus, countries that have expanded bilateral trade have a better chance of finding their incomes converging more rapidly than others.

Early 70's saw the increasing importance of international trade and commerce (refer Figure 1-2). World trade was slowly becoming an engine of global growth. This growth had positive impact on many economies like Japan, Western Europe, South East Asia etc., where the quality of life improved considerably.

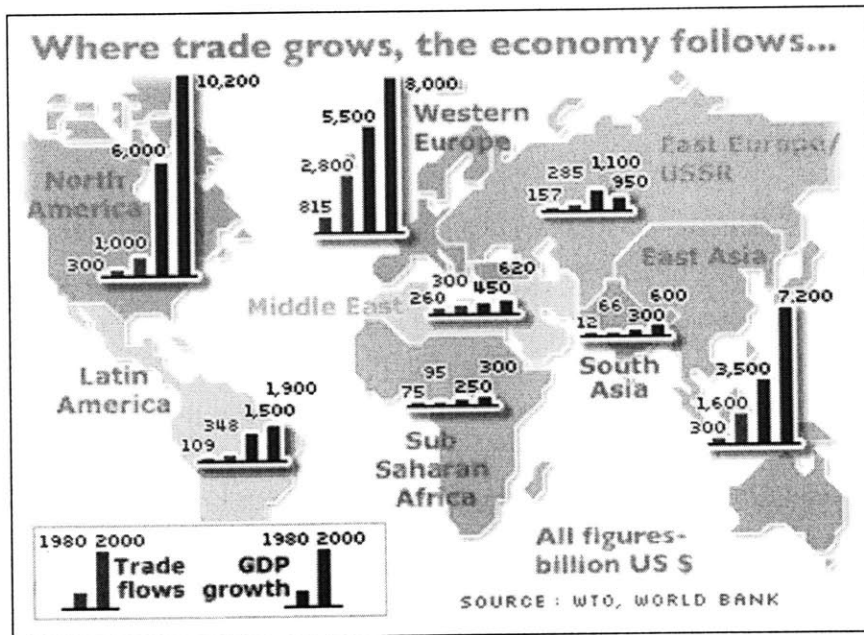


Figure 1-3: Global trade and GDP [7].

1.1.2 Role of Maritime Transport in International Trade

Shipping continues to be the dominant mode of transport for global trade, accounting for almost two thirds of world trade (Please refer Figure 1-4). Thus there is a strong relation between trends in maritime trade and global trade. Shashi Kumar and Jan Hoffmann [49]

discuss how trends in international maritime transport affect globalization, and how the maritime business is affected by globalization. The feasibility and relative economics of maritime transport significantly affects the International trade and generate new trends in international trade flows. It has been mentioned in [49] that “*halving transport costs increases the volume of trade by a factor of five*”.

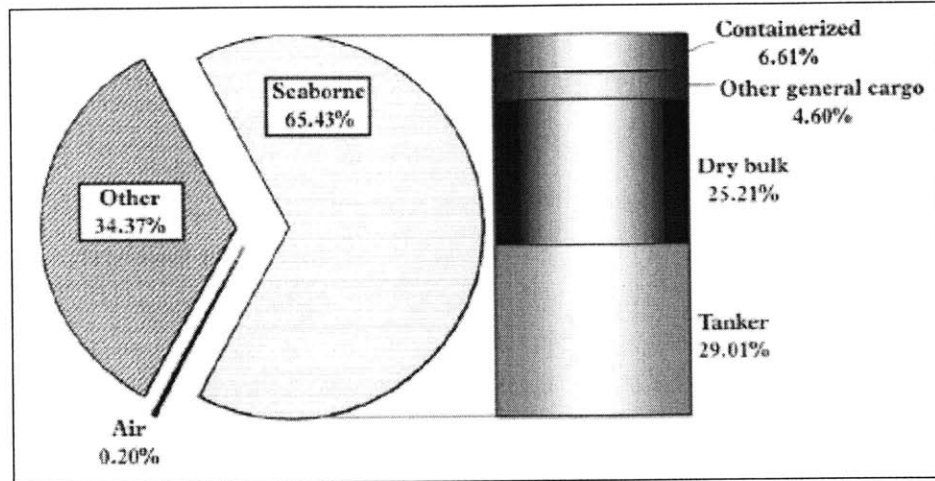


Figure 1-4: Seaborne trade as a share of World trade as of 2002 [49] (metric tons).

1.2 Thesis Outline

This thesis is structured as follows. Chapter 1 introduces and motivates the reader by comparing India with China, who had until a few decades back similar macro economic conditions. Also discussed in Chapter 1 is the interconnection of general economic picture of a country, trade, poverty and the importance of maritime trade. Chapter 2 proceeds to analyze the reasons for the strong economic and subsequent maritime growth in China. In Chapter 3 the current scenario of maritime sector in India is discussed. This will be followed by analyzing the reasons for limited growth of maritime sector and economy of India in comparison with China in Chapter 4. Chapter 5 performs numerical analysis to foresee the impact of a global shipping boom due to India, similar to the one experienced from the economic rise of China in 2001-2004. Finally Chapter 6 concludes the thesis by summarizing the key ideas from the thesis and a brief overview of the outlook. The notations used in this thesis are tabulated in Appendix.

Chapter 2

Analysis of China's Growth

2.1 Current Macro-Economic Picture

Various media sources in 2005 examined and explained the growth of China as the new economic power house of the world. China had achieved rapid economic growth led by exports over the past 25 years. This has resulted in improving the life of several hundreds of millions of its citizens. Moreover, China was accredited to being the engine for the growth of the world economy.

China's GDP growth has been twice the global rate in past 20 years. Based on these trends, China's economy should be bigger than the US' in a decade, in terms of Purchasing Power Parity (PPP). Please refer Table 2.1 for a ranked listing of the major economic entities and their GDP [30].

Rank	Country	GDP	Date of Information
1	World	\$55,500,000,000,000	2004 est.
2	United States	\$11,750,000,000,000	2004 est.
3	European Union	\$11,650,000,000,000	2004 est.
4	China	\$7,262,000,000,000	2004 est.
5	Japan	\$3,745,000,000,000	2004 est.
6	India	\$3,319,000,000,000	2004 est.
7	Germany	\$2,362,000,000,000	2004 est.
8	United Kingdom	\$1,782,000,000,000	2004 est.
9	France	\$1,737,000,000,000	2004 est.
10	Italy	\$1,609,000,000,000	2004 est.

Table 2.1: Ranking of major economic entities in terms of GDP (PPP) [30].

China's economy is characterized by a the highest levels of domestic savings resulting in

an economic growth led by investments. The composition of the Chinese economy is given in Table 2.2.

Agriculture	12.46%
Industry	47.28%
Services	40.26%

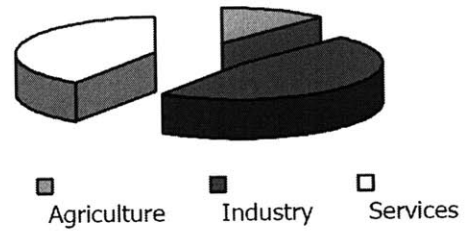


Table 2.2: Composition of Chinese economy [35].

2.2 Brief Review of Maritime Sector in China

The maritime profile of China represented as a percentage of the global total is depicted in Figure 2-1 (reproduced from [44]). The development of its ports has been important for China because of the export-driven growth in the country. The Chinese model of growth requires imports of vast quantity of commodities from around the World and then converting them to manufactured goods to be sold in the World markets. This requires the development of both bulk cargo shipping (liquid and dry) and containerized shipping. China has excellent port facilities, which are comparable with the best ports in the world. China accounts for around 18% to 20% of the World container throughput. In fact, three of the top 10 container ports in the World are in China. For a listing of major Chinese ports please refer Table 2.3.

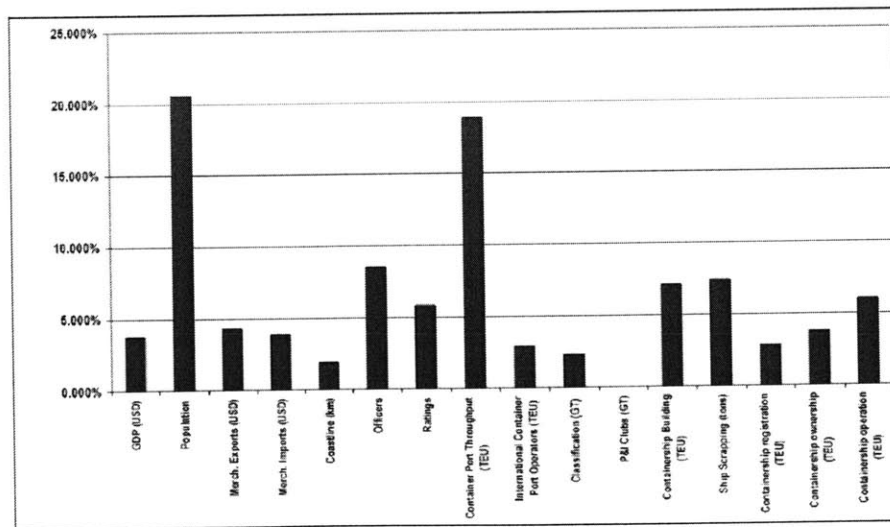


Figure 2-1: Maritime profile of China as a percentage of the World (reproduced from [44]).

As a result, China has experienced rapid growth in shipping volume to fuel this economic growth. Moreover, to enable this rapid growth in shipping volume, Chinese shipyards recorded an output of 30% of the world's shipbuilding efforts.

Ports	1991	1992	1995	1996	1997	2001	2002	2003	2004
Hong Kong (PRC)	6162	7972	12550	13460	14567	17900	19140	20449	21932
Shanghai	576	330	1527	1930	2520	8340	8610	11283	14557
Shenzhen						5076	7614	10615	13650
Kaohsiung (Taiwan)	3913	3961	5232	5063	5693	7541	8493	8840	9710
Qingdao	184	222		810	1030	2640	3410	4239	5140
Ningbo					257	1210	1860	2772	4006
Tianjin	339	190	702	800		2010	2410	3015	3814
Guangzhou	116	118			680	1730	2180	2762	3308
Xiamen			329	400		1290	1750	2331	2872

Table 2.3: Container traffic in major Chinese ports (1000TEUs) [45].

To clearly understand the maritime achievements of the Chinese model let us consider the following example: According to a report published by Drewry Shipping Consultants in 2004 [4], Far-East region has consistently enjoyed an average quarterly increase of 21.5% from the same quarter in the previous year (over 15% increase in year-on-year) in total port handling. Much of this growth in the Far-East region can be directly attributed to the rapid increase in finished goods flowing both into and out of the China. Only Eastern Europe with 18.9% and the Mid-East with 18.2% have experienced comparable quarterly increase. Please refer Figure 2-4.

Now let us compare the country wise analysis of container volume traffic for 1991 and further for 2004. The data is obtained from Containerisation International Yearbook, 1994 and Containerisation International Yearbook, 2005.

As Table 2.4 demonstrates, in 1991 the United States (US) dominates with 15,546,000 TEUs while China ranked is 17th in the world with 1,506,000TEUs, less than 10% of the share of US. The other top five countries were Japan, Singapore, Hong Kong and Taiwan.

By 2002, China with the inclusion of Hong Kong leads its position as the world leader in container volumes with 55,717,000 TEUs. However, even without Hong Kong, China would capture this position in terms of container volume with 36,577,000 TEUs. The US continues to enjoy steady growth in container tonnage volume with 29,577,000 TEUs, approximately 53% of China (including Hong Kong). Hong Kong, Singapore, Japan, Taiwan and South Korea follow China and US.

China sees shipbuilding as a vital industry, as it boosts domestic manufacturing and machinery industries, creates job opportunities and revenue, and improves the country's naval capacity. Further the country's shipbuilding industry has achieved an annual average growth of 17% over the past few years and China now accounts for a quarter of the world's

shipbuilding market, up from less than 5% five years ago. In 2005, China’s shipbuilding industry exceeded 10 million DWT for the first time in its history. China’s shipbuilding capacity exceeded Germany’s for the first time in 1995, rising to the third place behind South Korea and Japan. China presently builds about 15% of the world’s total tonnage of ships and holds 17% of all the global orders.

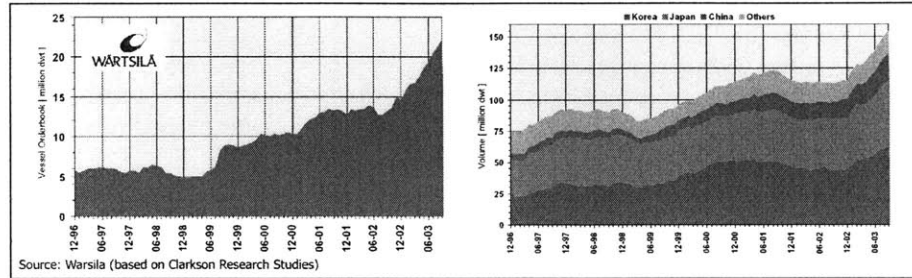


Figure 2-2: *Left:* Vessel order book at shipyards in China; *Right:* Shipyard order book in the world [46].

The leading shipbuilding company in China, China State Shipbuilding Corporation (CSSC) built 3.57 million DWT of new ships in 2004, up 64.5% over the previous year [10]. Of the total tonnage of ships constructed, 73.8% have been exported. In 2005, CSSC had delivered 5 million DWT ships, accounting for 40% of China’s output, and 7% of the world output [29]. With this CSSC became a top five shipbuilding corporations in the world. China Shipbuilding Industry Corporation (CSIC) the second biggest player built 3.17 million DWT of Ships in 2005 [28].

Around 30% of China’s trade, are operated by a single entity; the China Ocean Shipping Company (COSCO), which is a state-owned conglomerate with close ties to China’s military. It routinely supplies shipping support to Chinese military and naval exercises, and is Beijing’s principal carrier for foreign arms shipments.

2.3 China’s Emergence: Analyzing Reasons for Growth

China’s most successful policy initiatives have been in modernizing its infrastructure, allowing labor mobility, welcoming Foreign Direct Investment (FDI) and embracing competition. This thesis tries to dissect the Chinese maritime growth under two major headings: effective use of Non-living resources and Living resources. The primary reason for this growth has been the opening of the country to foreign trade and investment. The population of the world’s largest nation, previously unreachable by foreign business, quickly has become a huge source of labor to both produce and consume raw materials and finished products.

Country	1991	1992	1995	1996	1997	2001	2002
China (with Hong Kong)	7668	9213	17232	17927	20365	44726	55717
China (w/o Hong Kong)	1506	1241	4682	4467	5798	26826	36577
United States	15546	16742	19104	20588	23758	27308	29577
Japan	8782	8935	10604	12381	10892	13127	13501
Singapore	6354	7560	11846	12944	14135	15573	16986
Hong Kong	6162	7972	12550	13460	14567	17900	19140
South Korea	2571	2751	4503	4725	5637	9287	11543
Taiwan	6130	6179	7849	8078	8516	10426	11605
UK	4088	4379	4726	5090	6057	7058	7060
Netherlands	3856	4201	4880	5081	5574	6227	6742
Germany	3512	3602	4451	4657	5217	8427	9122
Spain	2270	2247	3165	3458	4102	6156	6659
Belgium	2090	2399	2863	3211	3628	5110	5758
UAE	2073	2506	3512	3808	3654	5082	5872
Italy	1870	1891	2992	3768	4700	7073	7918
Australia	1672	1834	2280	2384	2739	3775	4272
Puerto Rico	1615	1613	1626	1633	1838	1886	1426
France	1594	1302	1693	1803	2045	2998	3278
Philippines	1441	1158	1892	2260	2507	3091	3271
Canada	1434	1270	1740	1996	2212	2890	3300
Thailand	1172	1313	1962	2052	2100	3387	3801
Indonesia	1153	1329	2048	1764	1920	3902	4540
Malaysia	1074	1218	2075	2506	2976	6225	7542

Table 2.4: World container traffic by country (1000TEUs) [45].

2.3.1 Non-living Resources

Government Policy, Institutional Framework & Organizational Discipline

In the 25 years since China initiated reforms, Chinese GDP has grown at an average 9.4% a year, compared with average growth of 5.8% in the 25 years prior to reforms. Government policy has a huge role to play to help China achieve this growth rate. The following points highlight the initiatives the Chinese government has undertaken over the years.

- Development of Special Economic Zones (SEZs) and Export Processing Zones (EPZ). In China, the central government gives SEZs special policies and flexible measures, allowing them to utilize a special economic management system [6]. SEZs are listed separately in national planning (including financial planning) and have province-level authority for economic administration which allows:
 - Special tax incentives for foreign investments in the SEZs.
 - Greater independence on international trade activities.

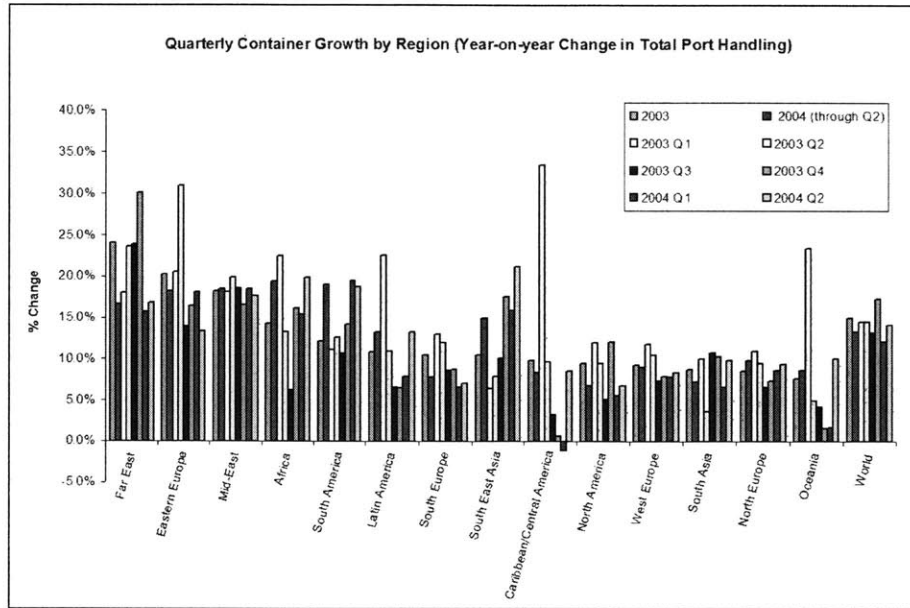


Figure 2-3: Region-wise quarterly growth in container handling [45].

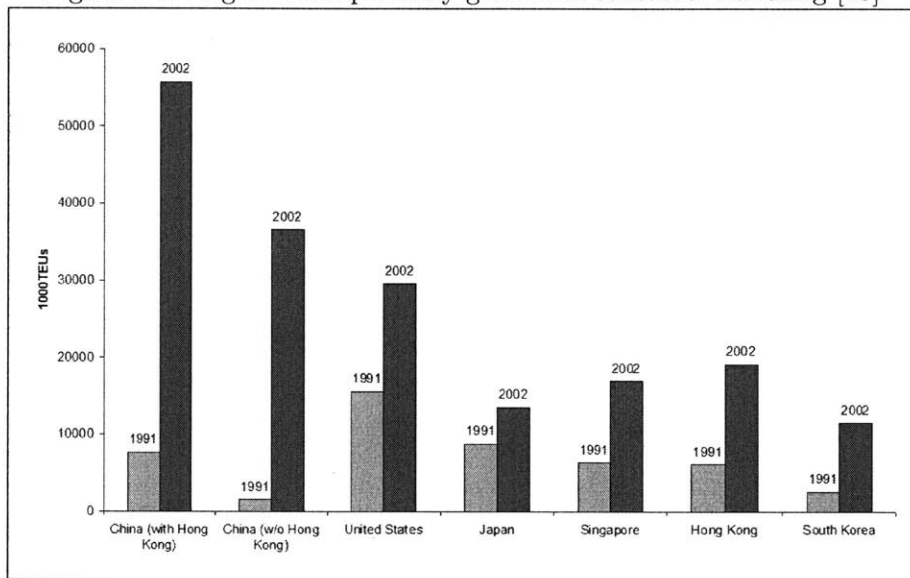


Figure 2-4: Comparison of world container traffic by country (1991 & 2002) [45].

– Economic characteristics are represented as “4 principles”:

1. Construction primarily relies on attracting and utilizing foreign capital.
2. Primary economic forms are Sino-foreign joint ventures and partnerships as well as wholly foreign-owned enterprises.
3. Products are primarily export-oriented.
4. Economic activities are primarily driven by market.

Ports in many of the SEZs have become the biggest in China due to the above incentives. Specifically the designation of Shenzhen and Guangzhou as SEZs has greatly aided their rise as important container ports in the China.

- Promotion of shipping, ocean trade and ship building, container manufacturers:
 - Loans at very low interest rates from government controlled banks
 - Grants to promote a specific trade, or develop a specific skill set
- Joint ventures between State Owned Enterprises (SOEs) and market leaders are yet another reason for sustained growth. As Chinese builders have become more competitive in world markets, Japanese and Korean shipbuilders are attracted to the mainland. Joint ventures between the developing Chinese shipbuilding industry and established Japanese and Korean yards will inevitably transfer technology, engineering skills and production know-how to China. Hundreds of Chinese engineers are being trained by their Japanese and Korean partners. Such transfers are a prerequisite for doing business with any state-owned enterprise in China.
- Government has recognized the need and has invested heavily in physical infrastructure. This point is discussed in greater depth in another subsection.
- The single-minded determination of the politicians to ‘*make it happen*’ differentiates China from other emerging countries. Chinese government has been accredited for making quick decisions, high levels of implementation and a tough stance against corruption. Corruption if proven guilty is often awarded with a life sentence. These are made easier on account of the political continuity which China enjoys.
- The government has focused on improving its human capital with a universal mandatory nine-year education requirement and by implementing aggressive labor reforms.
- China ensured greater acceptance from the rural population for its open economy plan, as it initiated agricultural reforms first, which helped accelerate rural incomes. Moreover, China has implemented its industrial reforms at a much faster pace than India.
- Chinese government has a plethora of regulations attempting to exercise tight controls over the media. The opening-up of the industry has extended to distribution and advertising, not to editorial content. Further international TV channels are not permitted to be televised in China, except in hotels and residential apartments used exclusively by overseas personnel. Strict media control imposed by the government has resulted in a population which is focused and disciplined. This has further brought

about a strong feeling of optimism in the mind of Chinese citizens. This has also helped a great deal in a near smooth transition to a market economy, where privileges from the socialist regime, for many have been eliminated.

Physical Infrastructure

An efficient and low-cost infrastructure facility is the key enabler of globalization and labor arbitrage. China's success in manufacturing has been enabled by the government's focus on the development of physical infrastructure such as roads, ports and electricity.

When China initiated reforms in the late 1970s, it focused on manufacturing as the key growth driver for the economy. Policymakers realized the importance of good infrastructure to attain their goals and have invested heavily in infrastructure creation since the early 1990s. It was realized that to ensure continued growth in economy and shipping, it was necessary to improve the infrastructure, container port facilities, navigation, and river barge services.

- Development of efficient ports is a primary reason for the growth of shipping in China and economy in general. Efficiency of Chinese ports is evident in the fact that the average lead time for a consignment to the US takes 2-3 weeks (6-12 weeks in the case of India) [36].
- The accumulated capital (foreign investments and domestic savings) has been rightly channeled into development of an infrastructure network to build scale of operation, which in turn enables the effective use of cheap labor. A focus on exports supplements domestic demand and improves cost competitiveness.
- Urbanization has helped China's manufacturing sector improve productivity through efficient access to critical infrastructure. The large-scale urbanization in China is evident in the reduced share of the agricultural workforce. The share of employment in the low income-generating agricultural sector dropped to 45% in 2001 from 68% in 1981.
- Development of shipyards, marine equipment makers, docking facilities have helped China play a leading role in the marine equipment market. Chinese government has called on China to become the largest shipbuilder in the world. Based on its estimates, by 2015, Shanghai is expected to become the world's largest shipbuilding base, tripling its capacity to 12 million DWT according to [10].

According to a news source [10], in June 2005, construction of the Changxing Shipbuilding Base on Shanghai's Changxing Island was initiated. This shipyard is expected

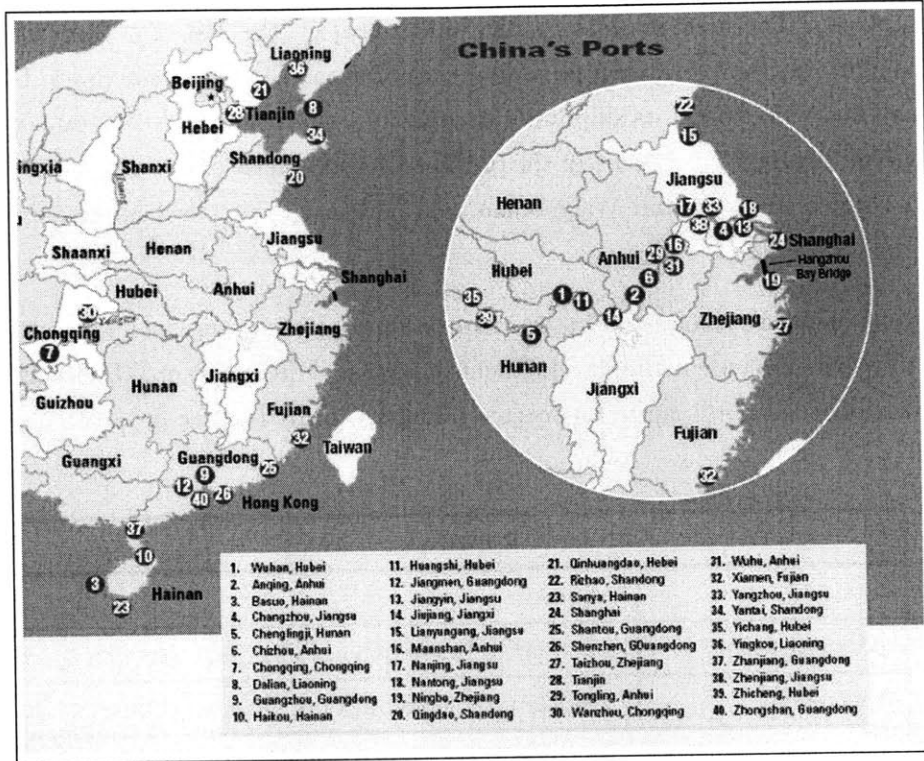


Figure 2-5: Location of major Chinese ports.

Container Traffic in Major Chinese Ports

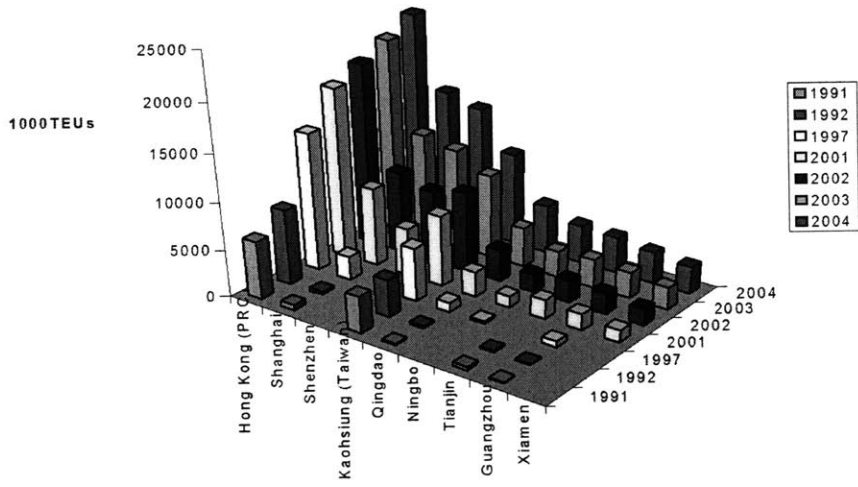


Figure 2-6: Container traffic in major Chinese ports (1000TEUs)[45].

to eventually become the world's largest shipyard, marking a major step forward in China's ambition to become the world's leading ship builder. The project consists of

two phases. The first phase is a US\$6 billion project, the Jiangnan Shipyard Corp, a subsidiary of China State Shipbuilding Corporation (CSSC), is moving to Changxing Island and will expand its shipbuilding capacity from the current 800,000 DWT a year to 4.5 million DWT by 2020. In the proposed second phase of the project, other CSSC subsidiaries, Hudong and Waigaoqiao, will add more yards in Changxing Island's 8 km long coastline.

- Development of secondary infrastructure to support the ports like highways, railways, waterways supplement the development of primary infrastructure. Please refer Table 2.5 for detailed information on surface transport infrastructure from the CIA website [30].

Railways	
Total	71,898 km
Standard gauge	71,898 km 1.435-m gauge (18,115 km electrified)
Dual gauge	23,945 km (multiple track not included) (2002)
Highways	
Total	1,809,829 km
Paved	1,447,682 km (at least 29,745 km of expressways)
Unpaved	362,147 km (2003)
Waterways	
	123,964 km (2003)

Table 2.5: Transportation infrastructure in China (July, 2005) [30].

- *Highways*: China has 1.76 million km in its highway network. Further China has been investing almost US\$24 billion annually (2-2.5% of GDP) on improving its highways.
- *Railways*: China has been efficient in using her railway infrastructure for efficient movement of goods and specifically containers for the transportation of manufactured goods. Special trains which carry containers connect the major ports to the inland. There are dedicated railway lines to carry container traffic and planned double-decker container carriages.
- *Waterways*: Economic growth in the coast continues to put strain on infrastructure development on the coast. Many foreign companies prefer the interior of

China where labor, real estate, and development costs are still extremely low. One major impediment against these types of developments is access to raw materials and transport of finished goods. Inland waterways along the Yangtze River were promoted. This had a significant effect on trade and in helping Shanghai to be placed as one of the top container ports in the world. Please refer [40, 41].

Geography & Natural Resources

China has greatly benefited extensively from its geography in terms of the proximity towards many of her economic partners (Japan, Korea, Taiwan, Singapore). China enjoys a good deal from the proximity and accession of Hong Kong. This has enabled China to obtain crucial management and production techniques, a distribution depot, capital and prior experience in shipping, port operation and shipbuilding and repairs.

Further, China is abundant in a variety of natural resources and is placed fourth in terms of area. Please refer Table 2.6 and Table 2.7 for a listing of the countries of the world based on area and the area of China respectively.

Rank	Country	Area (sq km)
1	World	510,072,000
2	Russia	17,075,200
3	Canada	9,984,670
4	United States	9,631,418
5	China	9,596,960
6	Brazil	8,511,965
7	Australia	7,686,850
8	European Union	3,976,372
9	India	3,287,590
10	Argentina	2,766,890

Table 2.6: Area of major countries of the world [30].

China also has many large rivers, with its water resources ranking first in the world. China has tapped this potential to the fullest by using waterways as an efficient and low cost mode of transport. Further, China is able to tap its huge rivers for production of power.

Vast quantities of arable land are another major natural resource. China now has 130.04 million hectares of cultivated land [9]. Major products are rice, wheat, tea, corn, millet, orange, sorghum, soybean, jute, cotton and ambary hemp, sugar beet, sugarcane, rapeseed and peanut and further large scale animal husbandry. One major product of China is

Total Area	9,596,960 sq km
Land Area	9,326,410 sq km
Water Area	270,550 sq km

Table 2.7: Classification of area belonging to China [30].

processed and semi processed food items, which are exported to many places around the world.

All non-ferrous metallic minerals that have been discovered in the world can be found in China, with deposit reserves ranking among the world's top. China has abundant mineral resources, with total reserves ranking third in the world. A key enabler of the growth is its huge natural resources. Its major natural resources include coal (biggest producer), iron ore, petroleum, natural gas, mercury, tin, tungsten, antimony, manganese, molybdenum, vanadium, magnetite, aluminum, lead, zinc, uranium, hydropower potential (world's largest).

Unlike Japan, Korea and many of the Asian nations, it does not worry about obtaining the natural resources or ores required for productions especially iron ore and non-ferrous metallic minerals (recent economic boom however has led to China importing vast quantities of iron ore, copper and other resources).

Financial & Banking Systems

Higher domestic savings, aided by positive demographic changes and rising FDI due to low foreign investment barriers, have helped increase capital accumulation in China. According to IMF estimates, capital accumulation explains a very large proportion of China's growth.

Time Period	National Savings Rate
Mid-1960's	25%
1980	34%
2003	45%

Table 2.8: Increase in China's savings rate [30].

Increase in China's savings rate (refer Table 2.8) has financed the acceleration in growth of physical capital accumulation and further GDP. Indeed, in the 1990s, on average, more than 4% points of China's GDP growth was accounted for by capital accumulation, which was supported by its high national savings rate. This has had a noteworthy effect on the

growth in maritime sector [36].

The biggest players in the Chinese banking system are the four state-owned banks, which have a market share of 58% of loans. The state-owned banks are strongly influenced by the policies of the government and hence perform adequate capital injection to priority areas found by the government. Ship building is a field of national importance and hence easy access to credit from these banks to ramp up capacity, expand operations and implement state-of-the-art technologies and innovation.

Free availability of credit has resulted in huge Non Performing Loans (NPLs) in its banking system; approximately 20% of the overall credit and 26% of GDP [36]. In 2006, the Big four banks in China, namely the Bank Of China, China Construction Bank, Industrial and Commercial Bank of China and Agricultural Bank of China reported an NPL ratio of 8.9% (according to a Chinese government estimate [27]). Their current NPL ratio, however, is still well above the 1% to 2% level reported by the renowned international banks.

Tax & Tariff Structure

China has also implemented major changes in its tax structure over the last 20 years. It has already cut its import tariff, such that the total import tariff as a proportion of the value of imports is already 3% (compared with 15% in India).

China also adopted the Value Added Tax (VAT) system in the mid 1990s, which further improved the efficiency of the tax system. The reduction of import tariff was instrumental in increasing imports thereby boosting bilateral trade and access to machinery, which further boosted production and hence exports.

Collection of taxes is done more efficiently and this has indirectly helped to increase capital spending of the government and cut budget deficits.

In addition, Hong Kong acts as a leading center for shipping operations and has signed double taxation relief arrangements with the US, UK, Korea, New Zealand and Netherlands. Shipowners from Hong Kong are thus exempt from tax on their international shipping income in the above mentioned countries. This has had a positive impact on China's shipping industry.

Judiciary & Legal Framework

Chinese legal system has developed substantially in the last two decades. For instance, the number of lawyers in China increased from just 5,500 in 1981 to around 110,000 in 1998. This has to a large extent brought rule of law, which helped Chinese shipping industry and the society as a whole.

A legal framework though not considered as developed as in India, is efficient and has had a role in bringing in a feeling of security for the investors, and hence foreign capital.

Influence of External Issues, International Politics

Former US President Richard Nixon once said, “*We can see that China is the basic cause of all our troubles in Asia*”. At the end of 1960’s one could view a host of issues involving China such as Cold War, its nuclear capabilities, relation of US with Taiwan/non-relationship with China, after effects of the Korean War, and the conflict in Vietnam.

There seems to be a political consideration which limited and shaped actions in the economic realm between the US and China. Business ties have moved from the margins to center stage in Sino-American relations over the past 25 years. President Nixon made his historic visit to Beijing on February 21, 1972. In the immediate aftermath of the 1972 opening, business loomed small in the budding Sino-American relationship. On both sides, strategic concerns dominated calculations. President Nixon’s primary objective in early 1972 was to isolate Hanoi to hasten a negotiated *peace with honor* in Vietnam. Over the longer run, President Nixon and his immediate successors nurtured the China tie as an integral part of a global strategy to counter the Soviet Union and its allies. This long-term strategy dovetailed nicely with Chinese leader Mao Zedong’s motivation to use China opening to the US as a counterweight to the Soviet military threat to China’s north. Shanghai Communiqué was signed between Nixon and Zedong, was a document which defined the framework of US-China, and was the first of three communiqués outlining bilateral relations. Notably, it stressed the differences between the US and China, as well as their shared opposition on regional hegemony and other issues.

In 1979, China began to lay the legal and policy groundwork for foreign trade and investment, and many American executives traveled to China, with visions of a huge market in their mind’s eye. The Carter Administration worked to clear away the legal underbrush on the US side, winning Most Favored Nation (MFN) trade status for the China for the first time in 1980.

President Ronald Reagan set aside his visceral aversion to all things communist and supported expanded ties with China as a way to complicate matters for Soviet leaders.

By the late 1980s, the cumulative effects of improved economic ties, substantial domestic reforms in China, and an easing of Cold War tensions increased the momentum of US-China trade and investment activities. Return on investments made by American companies in China impressed and further threatened the competitiveness of the European and Japanese counterparts. The Japanese and European companies followed a similar path of investing heavily in China and substantially increasing their trade ties.

2.3.2 Living Resources

Population, Demographics & Labor Costs

One key reason for the phenomenal growth of China is the labor arbitrage. From Table 2-7 one can obtain a list of the first 10 economic entities by labor force [30]. The labor force of China is 1.6 times the labor force of India and 5.2 times that of the US. This represents a huge surplus of laborers in China resulting in a labor arbitrage.

China has been efficient in converting this arbitrage to production. Further, China has benefited from a sharp fall in its age dependency ratio (ratio of the non-working to the working population) since the late 1960s. In fact surplus labor in China has already had a major impact on global inflation, by keeping the prices of products under control.

As a result of the demand for cheap labor and to maintain the labor arbitrage, China has evolved large scale migration of working population. About 150 million workers have migrated from the farms to the dynamic local economies of coastal China. Money that these factory workers remitted home has helped develop the interior provinces. Competition in local markets has kept down prices and has allowed wages to stay low and globally competitive.

Trained Workforce & Productivity

China has also focused on improving its human capital. China implemented free nine-year compulsory education (six years Primary and three years Junior High) in 1986 to ensure that rural areas were brought in line with their urban counterparts. This enabled a dramatic increase in literacy levels, especially in the rural areas. There has been a phenomenal increase in the number of graduates who have received tertiary education especially in the field of shipping, shipbuilding, and ocean technology and ocean sciences. A large number of these graduates are employed in local shipyards, design offices, planning and development centers. Further many are involved in the day to day logistics and operations in ocean related activities.

Hundreds of Chinese engineers are being trained by their Japanese and Korean partners from joint ventures between the developing Chinese shipbuilding industry and established Japanese and Korean yards. This will inevitably transfer technology, engineering skills and production know-how to the Chinese work force. Such technology transfers are a prerequisite for doing business with any state-owned enterprise in China.

Rank	Country	Labor force	Date of Information
1	China	760,800,000	2003
2	India	482,200,000	2004 est.
3	European Union	215,000,000	various
4	United States	147,400,000	2004 est.
5	Indonesia	111,500,000	2004 est.
6	Brazil	89,000,000	2004 est.
7	Russia	71,830,000	2004 est.
8	Japan	66,970,000	2004 est.
9	Bangladesh	65,490,000	2004 est.
10	Nigeria	55,670,000	2004 est.

Figure 2-7: Ranking of economies by their labor force [30].

Labor Laws

Flexibility in labor market regulation can attract foreign capital, create jobs and unleash higher growth. Political system in China is often criticized in the world for poor working conditions and an inadequate power for the employees but allows for a flexible labor market. Thus, foreign capital finds China a very safe place for doing business primarily because of the following reasons.

- Sheer flexibility when dealing with the laborers and workers is the single biggest factor. Recent data compiled by the World Bank collate the level of rigidity of hiring and firing rules in different nations, China has a score of 30 allowing flexibility (refer Table 2.9). In the words of Kaushik Basu, in a recent article with BBC World [37]: *“The fact that the less rigid nations also have more efficient economies, higher wages and a smaller share of laborers who are long-term unemployed may not be entirely a matter of coincidence.”*
- Existing labor laws are not fully enforced. Chinese laborers tend to work for 12 hours even though the labor is restricted to 43 hours per week. This flexibility could allow China to compete with other countries in gathering trade volume or labor intensive industries like shipbuilding.
- Hire and Fire policy, where by a firm is almost free to hire and fire workers with least amount of bother.

- Unionizing of labor is not allowed by law and thus the workers are not allowed to protest or conduct a strike.
- No mandatory reservation policies, for example women, based on race etc. present in US or in India.
- Government does not hinder any plan to hire workers with bias towards any of sex, age, qualifications etc.
- Chinese workers have strict standards of discipline and are willing to spend more man hours with the work than their western counterparts.
- Special economic zones have special rules for labor which encourage greater output and improved wages.

Country	Level of Rigidity Score (on 100)
India	48
Korea	34
China	30
Norway	30
Singapore	~0

Table 2.9: The level of rigidity of hiring and firing rules in select nations, 100 being the score of the highest conceivable rigidity [37].

For example consider the case: Suppose a shipbuilding firm wants to manufacture a product that has volatile demand - like container ships or even a bulk carrier. This firm may want to offer workers higher wages but make it clear to them that they could be given a month's notice and asked to leave. Such a possibility is not available in the previously leading maritime nations of the world like France, Germany, the Netherlands etc. Countries which have adapted to a more flexible labor rules (which allow room for free contracting) like China, Korea, US have either moved up the ladder or have made significant improvements in their share in maritime and shipbuilding activities.

The Chinese government on the other hand has had significant success in educating its workforce that flexible labor laws as is, contrary to popular perception, in the interests of the workers and has evolved complementary policies for providing social security and welfare to workers.

2.4 Reasons that could have Contained Growth in China

Though China is regarded as highly successful in its growth story, there are issues which have or could potentially hamper its growth. Some of them briefly discussed.

International Politics

Taiwan: Continued tension between the China and Taiwan could be a major reason for reduced growth of China. Ever since the communists won the Civil War in 1949, the China has regarded the Nationalist controlled Taiwan as a renegade province. The recent controversial resolution adopted by China to use force to prevent Taiwanese independence and the involvement of US in China-Taiwan relations makes this more complicated.

Communist Regime: For more than a decade preceding the opening, China's communist regime minimized economic ties abroad in the pursuit of national self-reliance and refused to assume foreign debt and lacked the legal infrastructure necessary to receive foreign investment. Further the events in Tiananmen Square in June 1989 severely frayed economic ties; the combination of moral revulsion in the US and the resurgence of orthodox forces in the PRC quickly dealt a body blow to US trade with and investment in China.

Decline in Strategic Importance & China as a Competitor: The collapse of the Soviet empire during 1989 virtually erased the strategic rationale for strong US-China political ties. Further rise of China is viewed as competition to US. This was made apparent with US proclaiming China as a competitor. In addition US and the rest of the world sees the evolving China-Russia axis as a challenge to the current World order.

Inadequate Institutional Support & Transparency in Institutions

China has relied on administrative power and flexibility, rather than market forces, to guide capital formation. Capital allocation is inefficient and prone to corruption as a result of which non-performing loans have piled up in the banking system.

China has achieved strong growth over the past 20 years, but will now face the major challenge of large-scale institutional transformation to reduce the risk of a major slowdown. Chinese capital markets are relatively underdeveloped. They lack depth since the free float in Chinese markets is currently around 30%, with the rest in the hands of government or other affiliated bodies.

China's weak financial sector is already hurting its economy. The recent overheating of the economy, with fixed investment growing at 45% in first quarter of 2004 is an example. The Chinese government has had to supplement monetary measures with administrative measures. China needs to implement major financial sector reforms and empower the central

bank to act preemptively against any overshooting of the economic cycle.

Revaluation of the Yuan

One soft spot in the export led growth of Chinese economy is the question of the value of the Chinese Yuan. Chinese Yuan is currently fixed to the US dollar. There is severe international pressure to freely float the Yuan. An increase in the value of Yuan could negatively impact the competitiveness of the Chinese economy and cheaper labor. This could lead to the departure of foreign investment from China. This is a very serious issue for the investment led growth enjoyed by China.

Social Disorder & Rebellion

The economic disparity between urban China and the rural hinterlands is among the largest in the world. Many impoverished rural dwellers are flocking to the country's eastern cities. Further Chinese citizens don't enjoy or are not guaranteed the personal privileges of:

- Rule of Law
- Protection of Property
- Democratic Political Setup
- Redistribution Channels
- Right to Information

These could be a flash point for a social rebellion which could turn the country into a chaos and subsequently might lead to completely new political setup which may not be able to attract investor confidence.

Miscellaneous Issues

China has focused correctly on improving the primary education. However, it needs to focus fully on tertiary education to meet the growing needs of a competitive economy to climb the economic ladder.

A downside of the economic boom has been environmental degradation; China is home to many of the world's most-polluted cities. This has led to increased levels of health care costs for the Chinese economy.

Other pressing problems include corruption, which affects every level of society, and the growing rate of HIV infection. The demographic trend is also disturbing as China's

one child policy has resulted in an aging society with fewer young people working for large number of elderly people.

Chapter 3

Overview of Maritime Sector in India

3.1 Current Macro-Economic Picture

When trying to understand macro economic situation in India over time, one can observe two major points. The *independence in 1947*, and the *economic liberalization in the early 1990s*. Independence from the United Kingdom paved the way for a self-sufficiency drive and led to indegenization of many basic industries. Major industrial and economic reform was introduced in 1991 to correct continuing high inflation, high fiscal deficits, and foreign exchange shortages. However the immediate cause for the reform was an economic crisis due to: (1) the collapse of the Soviet Union, then India's largest trading partner, and (2) the sudden drying up of both the domestic and West Asian markets due to the Gulf War, and (3) the spurt in the price of oil, the single largest import commodity for India. As a result, balance of payments became almost unmanageable; the current account deficit nearly doubled in the last half of the 1980s; likewise, the debt service burden rose to nearly 30% of export earnings in 1990 to 1991. In mid-1991 India negotiated a structural adjustment loan with the International Monetary Fund (IMF) that provided a mechanism for liberalizing and reforming its economic system.

After the opening up of the Indian economy for foreign trade and investment since 1991, the world's second most populated nation, previously unreachable by foreign business, quickly has become a huge source of labor to both produce, and a source of consumers to consume raw materials and finished products. India's gross domestic product (GDP) has recorded consistent growth after the liberalization to reach a rate of 8% per annum over the last three years in 2006. At the current rate, India's GDP in nominal terms will reach

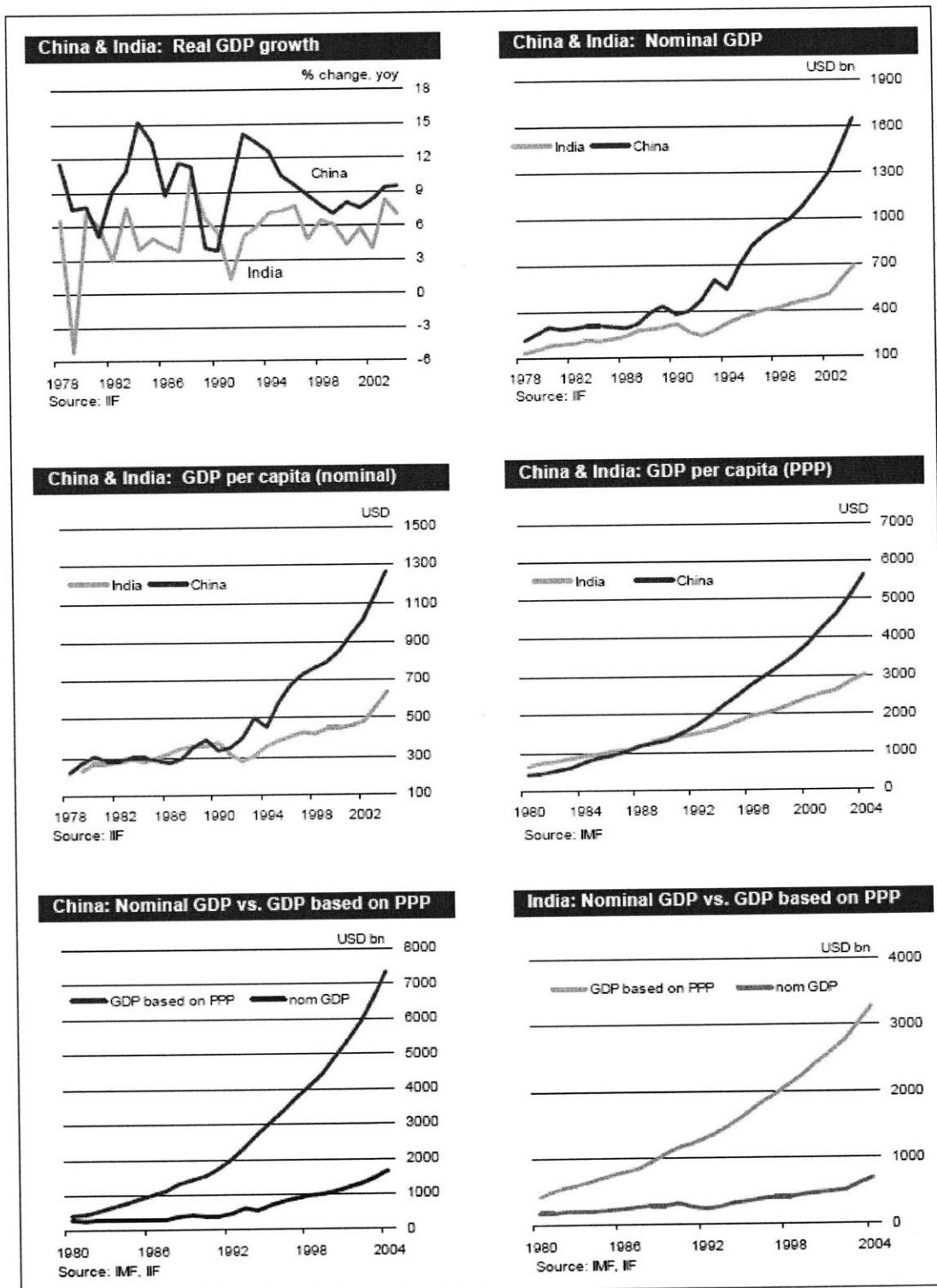


Figure 3-1: A snapshot of macro-economic picture of India and China [8].

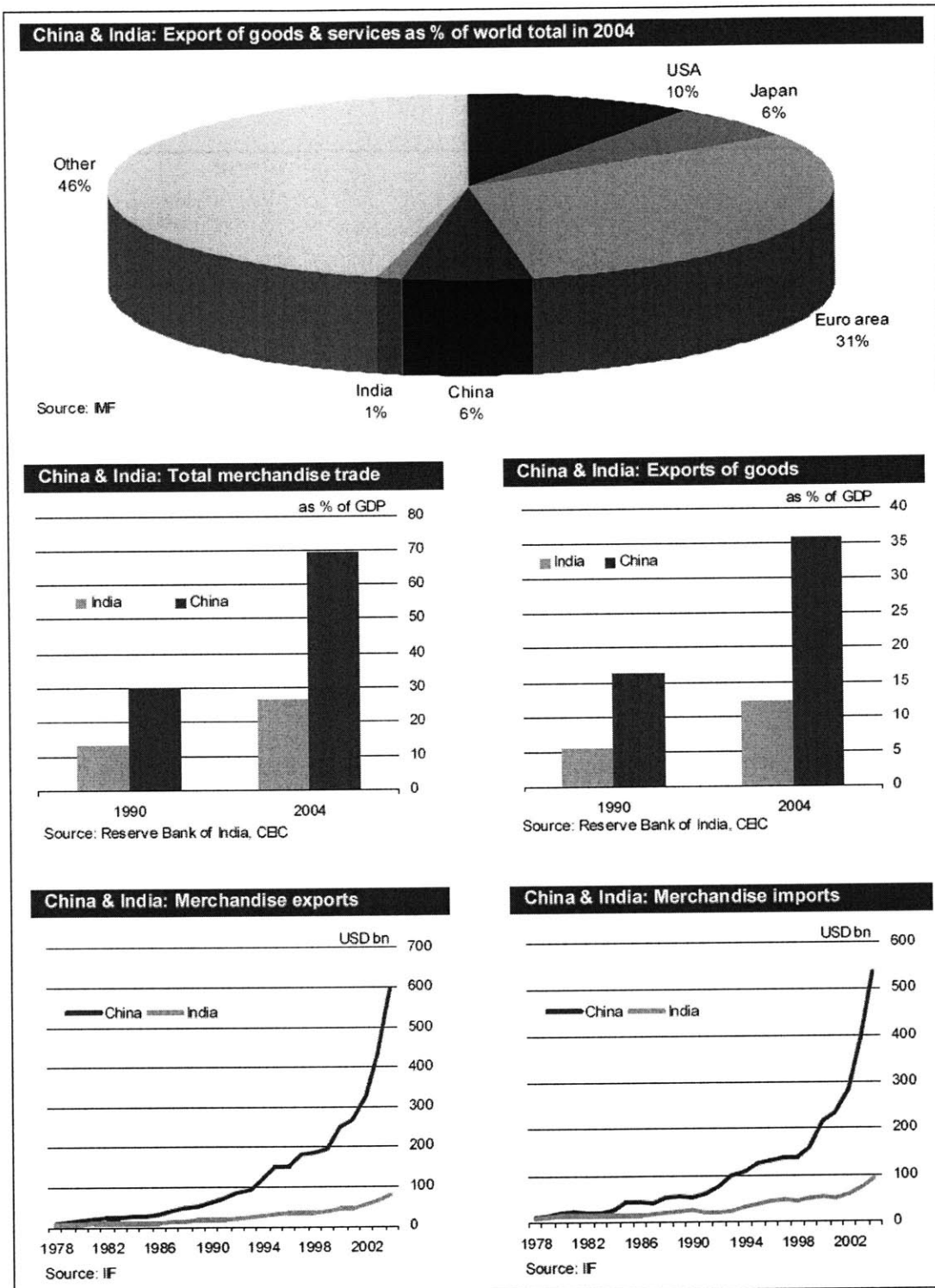


Figure 3-2: A snapshot of foreign trade of India and China [8].

US\$1 trillion by 2011, US\$2 trillion by 2020, US\$3 trillion by 2025, and US\$27 trillion by 2050, becoming the third largest economy after USA and China [47]. It is expected that this growth will be sustained if not improved.

List by the World Bank			List by the IMF		
Rank	Country	GDP (nominal) millions of US dollars	Rank	Country	GDP (nominal) millions of US dollars
—	World	40,885,976	—	World	40,894,780
—	European Union	12,823,113	—	European Union	12,865,602
1	United States	11,667,515	1	United States	11,734,300
2	Japan	4,623,398	2	Japan	4,671,198
3	Germany	2,714,418	3	Germany	2,754,727
4	United Kingdom	2,140,898	4	United Kingdom	2,133,019
5	France	2,002,582 ^[1]	5	France	2,046,292
6	Italy	1,672,302	6	Italy	1,680,112
7	People's Republic of China (Mainland)	1,649,329	7	People's Republic of China	1,653,686
8	Spain	991,442	8	Spain	1,041,338
9	Canada	979,764	9	Canada	993,443
10	India	691,876	10	South Korea	680,409
11	South Korea	679,764	11	Mexico	675,254
12	Mexico	676,497	12	India	665,071
			13	Australia	618,021

Table 3.1: Nominal GDP estimates from World Bank and IMF as on 2004 [19].

The export growth has been on a higher trajectory rising from US\$31 billion in 1997 to US\$57 billion in 2003 to US\$80 billion in 2005 (refer Figure 3-2 for details), and is expected maintain the momentum in the near future. Estimates by McKinsey predict that India could lift its share in world trade to 3.5% by 2015 from a share of 0.9% in 2005 [15]. Further there has been significant increase in foreign direct investment in India as an alternative to China in low cost manufacturing [47]. All this add up to significant growth in container shipping volumes and increased use of raw materials and energy.

3.2 Shipping and Port Operations in India

Over 90% of India's total trade volume (77% in terms of value and 97% of its international trade volume) is carried over sea [60]. The Indian peninsula, situated in the Indian Ocean, is also strategically located between the Atlantic Ocean in the west and the Pacific Ocean in the east, with a 7000 km long coastline, and 12 major and 148 operable minor and intermediate ports (refer Figure 3-4) [30]. The 12 major ports handled about 75% of port traffic in 2003-04. Though most major ports handle containers, only 7 are considered as major container ports.

Indian maritime services sector not only facilitates the transport of national and inter-

1	Calcutta-Haldia	7	Kandla
2	Mumbai	8	Mormugao
3	Jawaharlal Nehru	9	Paradip
4	Chennai	10	New Mangalore
5	Kochi (Cochin)	11	Tuticorin
6	Vizag	12	Ennore

Table 3.2: Twelve major ports in India.

national cargoes but also provides a variety of other services such as cargo handling services, ship repairing, freight forwarding, lighthouse facilities and training of maritime personnel (refer Figure 3-3).

Port operations in India are characterized by acute supply constraints as shown in Table 3.3. The major ports in India are overseen by the Port Trust Boards and are regulated by the Tariff Authority for Maritime Ports (TAMP). Minor ports are overseen by the state governments.

On the eve of independence in 1947, India had only 60 vessels with a tonnage of 0.192 million gross registered tonnage (GRT). By 2006, these figures increased to 313 vessels and 7.55 million GRT respectively as depicted in Table 3.4. Nevertheless, the national flag carriers are fast losing their share of trade to major global players.

Shipping industry in India was fairly liberalized even before the 1990's and there were no major restrictions on the entry of private shipping companies. Indian shipping, as it exists today, is marked by the presence of a few large and medium sized national shipping

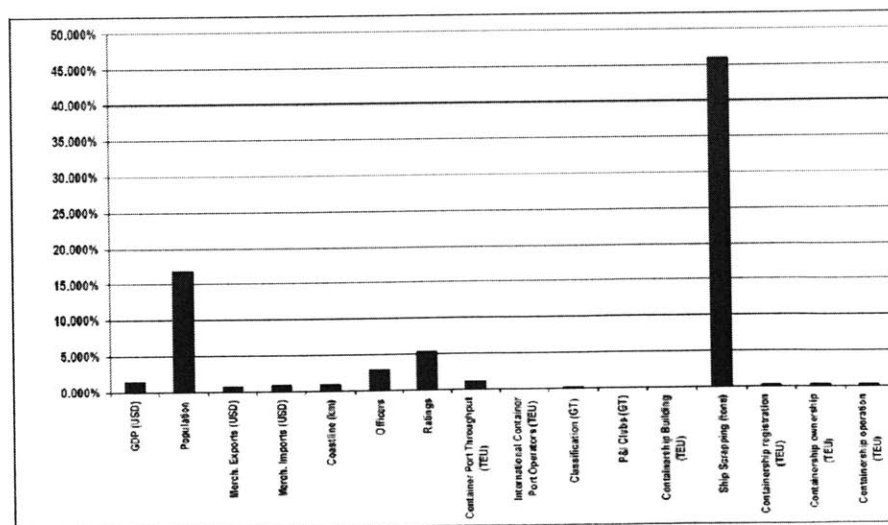


Figure 3-3: Maritime profile of India as reproduced from [44].

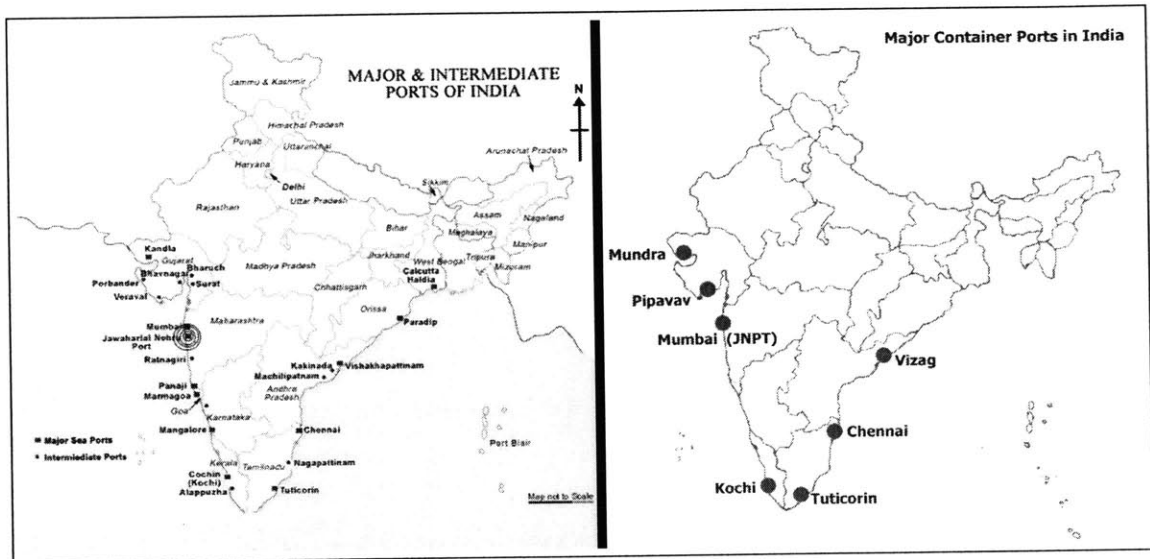


Figure 3-4: *Left*: Location of major and intermediate ports in India; *Right*: Major container ports in India.

Period	Capacity	Traffic	Capacity Utilization
	Million Tonnes	Million Tonnes	Million Tonnes
1990-1991	N.A.	151.67	N.A.
1991-1992	169.23	156.64	92.56
1995-1996	177.21	215.21	121.44
2000-2001	291.45	281.13	96.46
2001-2002	343.95	287.58	83.61
2002-2003	362.75	313.55	86.44
2003-2004	389.5	344.8	88.52
2004-2005	397.5	383.63	96.51

Source: Department of Shipping, Government of India

Table 3.3: Currently available capacity and capacity utilization at major Indian ports [60].

	China	India
Ships	1700	313
GRT	20,441,123	7,550,865
DWT	30,808,417	12,891,376

Table 3.4: A comparison of merchant marine of India and China (above 1000GRT) [30].

companies and a host of private players who together carry around 30% of the country's overseas trade. The list of major Indian carriers is produced in Table 3.5. The biggest player is the Shipping Corporation of India (SCI), a government owned company. The next two players Great Eastern Shipping Company and Essar Shipping are privately owned.

These companies, enjoy special rights and privileges like tax breaks, and government has announced various measures to support the growth of the domestic shipping industry. Government-owned/controlled cargo is channeled by the chartering wing of the Ministry of

Shipping called *Transchart*. As per this policy, the first right of refusal for carriage of such cargoes is given to Indian vessels. These regulations have resulted in barriers for entry for foreign shippers in select cargo.

The contribution of the Indian shipping industry to the economy is positive. 1% change in GRT brings about a change of 0.0068% in GDP [1].

Company	Revenues (Million USD)	No. of Ships Owned	Tonnage (million DWT)
Shipping Corporation of India (SCI)	706.6	83	4.62
Great Eastern Shipping Company	372.9	40	2.87
Essar Shipping Limited	227.7	27	1.3
Mercator Lines Limited	124.6	22	1.98
Varun Shipping Company Limited	86.4	19	0.34

Source: Various Company Websites (2004-2005)

Table 3.5: Key players in Indian shipping activity reproduced from various company websites.

Period	Coastal		Overseas		Indian Total		World	
	Ships	MGT	Ships	MGT	Ships	MGT	MGT	
1997-1998	234	0.643	244	6.2	478	6.843	439	
1998-1999	250	0.656	240	6.212	490	6.868	441.1	
1999-2000	273	0.682	240	6.231	513	6.913	449.4	
2000-2001	316	0.697	230	6.119	546	6.817	475.2	
2001-2002	336	0.734	224	6.087	560	6.821	487	
2002-2003	425	0.805	191	5.372	616	6.178	503	
2003-2004	436	0.808	203	6.136	639	6.944	533.3	
2004-2005	458	0.811	228	7.202	686	8.013	546.6	
CAGR	Last 7 years	10.07%	3.37%	-0.96%	2.16%	5.30%	2.28%	
	Last 2 years	3.81%	0.33%	9.26%	15.79%	5.53%	13.89%	

Based on Tonnage Statement, Government of India

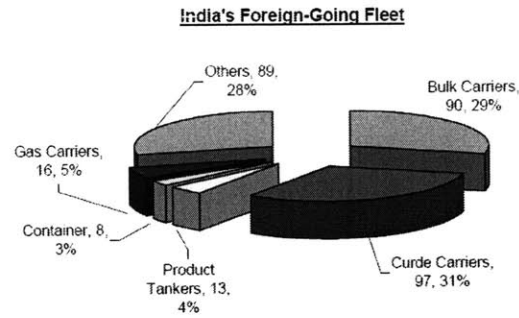
Table 3.6: Growth in Indian shipping activity reproduced from [17] (based on tonnage statement, Government of India).

Indian shipping companies, manage a variety of ships as depicted in Figure 3-5. India is heavily dependent on the imports of crude and hence one can find a large number of crude carriers and gas carriers. India also export certain grades of iron ore and import other grades of iron ore, coke, and grains leading to a fair share of bulk carriers. Note that Indian carriers operate very few container ships unlike the major global carriers.

3.2.1 Container Shipping and Port Operations in India

India has lagged behind others in adapting to containerization. Containerized cargo traffic is still poor when compared with the larger international ports (refer Table 3.7). As of 2005, only 38 million tons out of 78 million tons of cargo was being containerized in India [57]. The largest container port in the world in 2004, Hong Kong, processed 21.9 million

India's Foreign-Going Fleet		
Vessel Type	Number of Vessels	Percentage
Bulk Carriers	90	29%
Curde Carriers	97	31%
Product Tankers	13	4%
Container Carriers	8	3%
Gas Carriers	16	5%
Others	89	28%
Total Foreign Going Vessels	313	-



Based on CIA World Fact Book

Figure 3-5: Classification of India's foreign going fleet [30].

TEUs. The 10th largest port, Dubai, processed 6.4 million TEUs. In contrast, Jawaharlal Nehru Port (JNPT) at Mumbai, India's largest container port, handled around 2.5 million TEUs in 2003-04 [12].

Container shipping in India suffers from inefficient and unreliable infrastructure for container movement (ports, highways, railways), causing a gaping hole in the demand and supply. These bottlenecks results in huge lead times, costly transportation, port handling charges etc. Due to the above reasons, 45% of container traffic to India is now transshipped via Colombo (15%), Klang/Singapore (16%), Dubai, Salalah etc (14%). There are cases where a cargo that takes 6 days from Singapore to Mumbai would sit in the port for 30 days before it is unloaded.

Nevertheless, India is keen to catch up with others. Recent initiatives by government to improve the transportation sector has resulted in the national highway program [62] to upgrade the highways, the Sagar Mala (string of pearls) program [50] to upgrade the port infrastructure, the freight corridor railway upgradation plan to connect the manufacturing north to the western ports. Container terminals at JNPT were established as the gateway ports for container traffic to India only in 1999 and has a current market share of around 60% of the total container traffic within the country (refer Figure 3.8).

Success of Mumbai (JNPT) and the heavy congestion there, have led to substantial investments in recent times by private players in the ports of Mundra (Kandla), Tuticorin and Kochi (Cochin). P&O Ports operate one terminal at Mumbai, and have obtained the license to develop, operate and manage the container terminal at Chennai (Madras). DP World with United Liner Agencies developed Visakhapatnam (Vizag) as a deep-water eastern gateway terminal on the Bay of Bengal coast of India. In the last couple of years, several liner companies have started weekly and biweekly services linking India.

Following the increased container volume, Indian ports are trying to take on the role of a hub port (transshipment) to attract large size mother vessels. As depicted in Figure 4-3,

WORLD PORT RANKING - 2004									
TOTAL CARGO VOLUME, METRIC TONS (000s)					CONTAINER TRAFFIC (TEUs, 000s)				
RANK	PORT	COUNTRY	MEA	TONS	RANK	PORT	COUNTRY	TEUs	
1	Singapore	Singapore	FT	393,418	1	Hong Kong	China	21,984	
2	Shanghai	China	MT	378,962	2	Singapore	Singapore	21,329	
3	Rotterdam	Netherlands	MT	352,563	3	Shanghai	China	14,557	
4	Ningbo	China	MT	225,850	4	Shenzhen	China	13,615	
5	Hong Kong	China	MT	220,879	5	Busan	South Korea	11,430	
6	Busan	South Korea	RT	219,760	6	Kaohsiung	Taiwan	9,714	
7	Guangzhou	China	MT	215,190	7	Rotterdam	Netherlands	8,281	
8	Tianjin	China	MT	206,161	8	Los Angeles	United States	7,321	
9	South Louisiana, LA	United States	MT	203,517	9	Hamburg	Germany	7,003	
10	Houston, TX	United States	MT	183,419	10	Dubai	United Arab Emirates	6,429	
11	Nagoya	Japan	FT	182,289	11	Antwerp	Belgium	6,064	
12	Chiba	Japan	FT	169,254	12	Long Beach	United States	5,780	
13	Kwangyang	South Korea	RT	165,875	13	Port Kalang	Malaysia	5,244	
14	Qingdao	China	MT	161,650	14	Qingdao	China	5,140	
15	Ulsan	South Korea	RT	156,517	15	New York/New Jersey	United States	4,478	
16	Kaohsiung	Taiwan	MT	152,468	16	Tanjung Pelepas	Malaysia	4,020	
17	Antwerp	Belgium	MT	152,327	17	Ningbo	China	4,006	
18	Qinhuangdao	China	MT	150,320	18	Tianjin	China	3,814	
19	Dalian	China	MT	145,162	19	Tanjung Priok	Indonesia	3,597	
20	New York/New Jersey	United States	MT	138,328	20	Laem Chabang	Thailand	3,529	
21	Shenzhen	China	MT	135,246	21	Bremen/Bremerhafen	Germany	3,469	
22	Yokohama	Japan	FT	126,960	22	Tokyo	Japan	3,358	
23	Hamburg	Germany	MT	114,484	23	Guangzhou	China	3,308	
24	Inchon	South Korea	RT	113,073	24	Gioia Tauro	Italy	3,261	
25	Port Hedland	Australia	MT	108,500	25	Algeciras	Spain	2,937	
26	Kitakyushu	Japan	FT	103,245	26	Yantian	China	2,872	
27	Port Kelang	Malaysia	FT	99,911	27	Yokohama	Japan	2,718	
28	Marseilles	France	MT	94,093	28	Manila	Philippines	2,698	
29	Osaka	Japan	FT	93,147	29	Felixstowe	United Kingdom	2,675	
30	Tokyo	Japan	FT	91,427	30	Jeddah	Saudi Arabia	2,426	
31	Dampier	Australia	MT	87,928	31	Jwarharial Nehru	India	2,361	
32	Kobe	Japan	FT	85,661	32	Salalah	Oman	2,229	
33	Hay Point	Australia	MT	85,559	33	Colombo	Sri Lanka	2,221	
34	Richards Bay	South Africa	HT	84,954	34	Dalian	China	2,211	
35	Tubarão	Brazil	MT	84,433	35	Kobe	Japan	2,177	
36	Newcastle	Australia	MT	83,560	36	Nagoya	Japan	2,155	
37	Baumont, TX	United States	MT	83,243	37	Valencia	Spain	2,145	
38	Dubai	United Arab Emirates	MT	77,380	38	LeHavre	France	2,132	
39	Itaquí	Brazil	MT	76,958	39	Keelung	Taiwan	2,070	
40	LeHavre	France	MT	76,175	40	Oakland	United States	2,043	
41	Vancouver	Canada	MT	73,574	41	Osaka	Japan	2,009	
42	Amsterdam	Netherlands	MT	73,176	42	Hampton Roads	United States	1,982	
43	Long Beach, CA	United States	MT	72,684	43	Melbourne	Australia	1,910	
44	Corpus Christi, TX	United States	MT	71,648	44	Barcelona	Spain	1,883	
45	New Orleans, LA	United States	MT	70,886	45	Santos	Brazil	1,883	
46	Huntington - Tristate	United States	MT	70,180	46	Charleston	United States	1,864	
47	Santos	Brazil	MT	67,609	47	Khor Fakkan	United Arab Emirates	1,819	
48	Gladstone	Australia	MT	63,148	48	Tacoma	United States	1,798	
49	Texas City, TX	United States	MT	61,987	49	Seattle	United States	1,776	
50	Algeciras	Spain	MT	61,294	50	Durban	South Africa	1,717	

Abbreviations: MT=Metric Ton HT= Harbor Ton. FT=Freight Ton. RT = Revenue Ton.

NOTE: The cargo rankings based on tonnage should be interpreted with caution since these measures are not directly comparable and cannot be converted to a single, standardized unit.

Sources: Shipping Statistics Yearbook 2005; Containerisation International Yearbook 2006; U.S. Army Corps of Engineers, Waterborne Commerce of the United States CY 2004; AAPA Advisory, May 8, 2006; various port authority internet sites.

Table 3.7: The World's largest container ports in 2004 [12, 24]. In contrast, India's largest container port JNPT handled only 2.5 million TEUs.

Kochi port has a unique geographical advantage of being close to international sea trade routes which connect Europe and Arabian Gulf to South East Asia and the Far East. In 2005, DP World formally signed an agreement with Kochi Port to construct, develop and operate an international container transshipment terminal. This transshipment terminal project is expected to be a unique project in infrastructure to boost containerization in India.

To summarize, the container operations in India were characterized by a surging demand for container traffic, modernization/upgradation/privatization of marine infrastructure, and the presence of three major players: P&O ports, DP World and AP Moller-Maersk [55]. Container shipping in India is characterized by low participation by Indian companies,

Port-wise Container Traffic Handled in India (1999-2000 to 2003-2004)					
1000 TEUs					
Ports	1999-00	2000-01	2001-02	2002-03	2003-04
Kolkata	147	138	98	106	123
Haldia	28	51	93	117	137
Paradip	-	-	-	2	4
Visakhapatnam	20	20	22	22	20
Chennai	322	352	344	425	539
Tuticorin	137	157	214	213	254
Kochi (Cochin)	130	143	152	166	170
New Mangalore	-	2	4	6	7
Mormugao	4	4	6	9	10
J.N.P.T. (Mumbai)	1318	1510	1827	2143	2466
Mundra (Kandla)	79	91	126	157	170
Total	2185	2468	2886	3366	3900

Source : Major Ports of India, a Profile 2003-2004, Indian Ports Association.

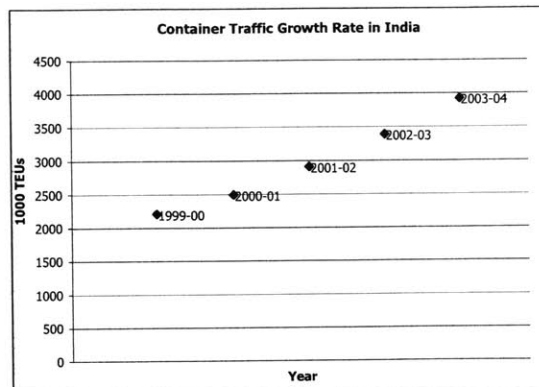


Table 3.8: *Left:* Port-wise container traffic handled in India; *Right:* Container traffic growth rate in India [33].

increasing number of liners calling directly at Indian container ports with vessels which are small or medium sized.

3.2.2 Bulk Cargo Shipping and Port Operations in India

India exports iron ore primarily to China. Details of the iron ore cargo port operations in India is given in Table 3.9. In addition Indian ports also handle specific bulk products like sulphur, fertilizer, cement, polymer, grains and coal in comparatively lesser quantities.

Iron Ore Handling Facilities in India (as on 31-03-2005)							
Ports	No. of Berths	Vessel Size (DWT)	Barge Unloader	Equipment		Ship Loader	Stack Yard Capacity (in 000 tonnes)
				Stacker	Reclaimer		
HALDIA	1	65,000-70,000	-	1500 TPH	1250 TPH	2x3000 TPH	535
PARADIP	1	60,000	-	2x2500 TPH	2x1500 TPH	1x2500 TPH	500
VISAKHAPATNAM	1	1,50,000	-	2x2700 TPH	3x4000 TPH	1x8000 TPH	1200
ENNORE	Temporary Barage loading Jetty	40,000-65,000	-	Conveyor system with barge loading to load@ 800TPH	Conveyor system with barge loading to load@ 800TPH	-	200
CHENNAI	1	1,50,000	-	2x2000 TPH	2x4000 TPH	2x4000 TPH	600
NEW MANGALORE	1	60,000	-	-	2x3500 TPH	1x6000 TPH	550
MORMUGAO	1	2,75,000	Grab unloader 8x500 TPH	3x3250 TPH	2x4000 TPH	2x4000 TPH	1000
			Continuous unloader 1x1250 TPH	-	-	-	-

Source: Indian Ports Association (<http://www.ipa.nic.in>)

Table 3.9: Iron ore handling facilities in India [34].

India's ocean going fleet consists of 90 bulk carriers carrying iron ore, fertilizers, cement, coke, grain and other commodities.

Under current Indian government regulations, LNG vessels importing gas must be Indian registered and at least 26% owned by an Indian company and the ships should employ Indian officers on board their LNG carriers [43]. Foreign partners should also agree to transfer technology to the Indian partner such that within 5 years, tankers can be maintained and operated by the Indian company. If an existing vessel is used, the foreign company owning the LNG carrier should have an Indian partner. LNG users require permission from the Directorate General of Shipping for chartering a foreign flag vessel to ship the fuel.

1	Dahej	LNG Terminals Currently Under Use
2	Hazira	
3	Kochi	LNG Terminals Under Construction
4	Dabhol	
5	Jamnagar	Proposed LNG Terminals
6	Pipavav	
7	Trombay	
8	Mangalore	
9	Ennore	
10	Kakinada	
11	Gopalpur	
12	Paradeep	

Table 3.13: LNG terminals in use, implementation stage and under planning stage. If all the terminals are completed India will have importing capacity of 50 MMPTA of LNG.

India has two operating LNG terminals at Dahej (operated by Petronet LNG) and Hazira (operated by Shell). India is currently building two at Kochi and Dabhol and several others are on the anvil as depicted in the Table 3.13.

Currently there are two Indian vessels (Disha and Rahi) owned by Petronet LNG (Shipping Corporation of India and Mitsui O.S.K. each owns a 29% stake). Varun Shipping Company Limited owns the largest LPG fleet (11 vessels) in the country i.e. 76% of the total LPG tonnage (by DWT) operating under Indian flag. Other major national shipping companies like Great Eastern Shipping Company currently own smaller LPG crafts and plan to enter the LNG fray with joint ventures.

3.2.3 Coastal Shipping & Inland Water Transport in India

Waterborne freight transportation is broadly divided into *inland water transport* and *shipping*. Shipping, in turn, can again be divided into two categories *coastal shipping* and *overseas shipping* [54]. Inland water transport and coastal shipping hold great promise

which 32.2 mt (24.8%) was domestic production and the balance 97.64 mt (75.2%) was imported. Demand for crude oil is estimated to grow at 7%, leading to a demand of 195 mt in 2011-12 of which 85% have to be imported.

In addition, India is building a huge refining capacity from the current level of 130 mt to 240 mt within the next few years to cater to the demand from developed economies (also domestic demand) withdrawing from refining due to environmental reasons. Hence, it is expected that the above increase will lead to a huge demand for liquid bulk cargo carrying capacity. Indian government expects domestic flag carriers to carry a significant part of the increased demand. As shown in Table 3.11, a major share of the crude imports done by domestic companies is done by Shipping Corporation of India and Great Eastern Shipping.

Company	Million DWT	Percentage
Shipping Corporation of India	3.71	44
Great Eastern Shipping	2.87	34

Table 3.11: Major crude carriers in India and their market share [34]. Both the companies have plans for significant increase in carrying tonnage.

LNG & LPG Shipping India

Liquefied gas shipping is characterized by being highly capital-intensive, low down time of ships (fast vessels), need to cater to the physical requirements of the contract, trade and ports [53]. This makes operating and maintaining an LNG/LPG carrier much more intensive and requiring more skill and operational capabilities than an ordinary ship.

The economic growth of India requires energy and LNG is seen as a green and socially accepted alternative. However, the domestic production of natural gas cannot satisfy the demand (refer Table 3.12) and has to be imported through LNG ships [53].

Thus in terms of tonnage, India is likely to import 62 million metric tones per annum (MMPTA) by 2012 (Japan's present import level) and 84 MMPTA by 2025 [51]. To handle this quantity of imports, India will require around 10 to 12 vessels over the next 5 years, 25 LNG vessels by 2012 and 34 vessels by 2025, assuming that one vessel can transport 2.5 MMPTA [51].

Year	Domestic Production	Forecasted Demand	Gas Deficit (Need to be imported)
2006-2007	89	231	14
2011-2012	90	313	223
2024-2025	90	391	301

Table 3.12: India's Future Natural Gas Demand (MMSCMD) [21].

Under current Indian government regulations, LNG vessels importing gas must be Indian registered and at least 26% owned by an Indian company and the ships should employ Indian officers on board their LNG carriers [43]. Foreign partners should also agree to transfer technology to the Indian partner such that within 5 years, tankers can be maintained and operated by the Indian company. If an existing vessel is used, the foreign company owning the LNG carrier should have an Indian partner. LNG users require permission from the Directorate General of Shipping for chartering a foreign flag vessel to ship the fuel.

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8	Mangalore	
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11	Gopalpur	
12	Paradeep	

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	DWT
LPG Tonnage	343046
LNG Tonnage	160000
Source Company Websites	

Table 3.14: LNG and LPG tonnage in India.

mainly because it is the most energy efficient and cheapest mode of transport for carriage of bulky goods like iron and steel, iron ore, coal, timber, etc. Coastal shipping can reduce the stress on the already congested road and rail network in India.

The share of inland waterways and coastal shipping in the total domestic cargo is very low in India, compared to other maritime countries. EU has 43% of its cargo handled by coastal shipping while in India it represents only 7% of the domestic traffic.

In India, three inland waterways (refer Figure 3-6) have been notated as *national waterways*, namely:

- *National Waterway 1*: Allahabad-Haldia stretch of the Ganga-Bhagirathi-Hooghly river system (1620 km).
- *National Waterway 2*: Saidiya-Dhubri stretch of the Brahmaputra river system (891 km).
- *National Waterway 3*: Kollam-Kottapuram stretch of West Coast Canal (168 km) along with Champakara canal (14 km) and Udyogmandal canal (23 km).

3.3 Shipbuilding, Ship Repair & Ship Scrapping in India

Shipbuilding is characterized by high capital investments, cyclical business and low levels of automation with profitability coming from scale of operations. With rising labor costs in previously developed economies, shipbuilding has slowly moved towards countries with a lower wage structure. While Japan, Korea and now China have taken advantage of this situation, Indian shipbuilding has just not been able to cash in on this trend. This is in spite of the availability of technical expertise, geographical location and lower wage levels.

3.3.1 Major Shipbuilding & Ship Repair Yards in India

Government Owned:

Major shipyards in India are all government owned and are listed below:

1. Cochin Shipyard Limited at Kochi

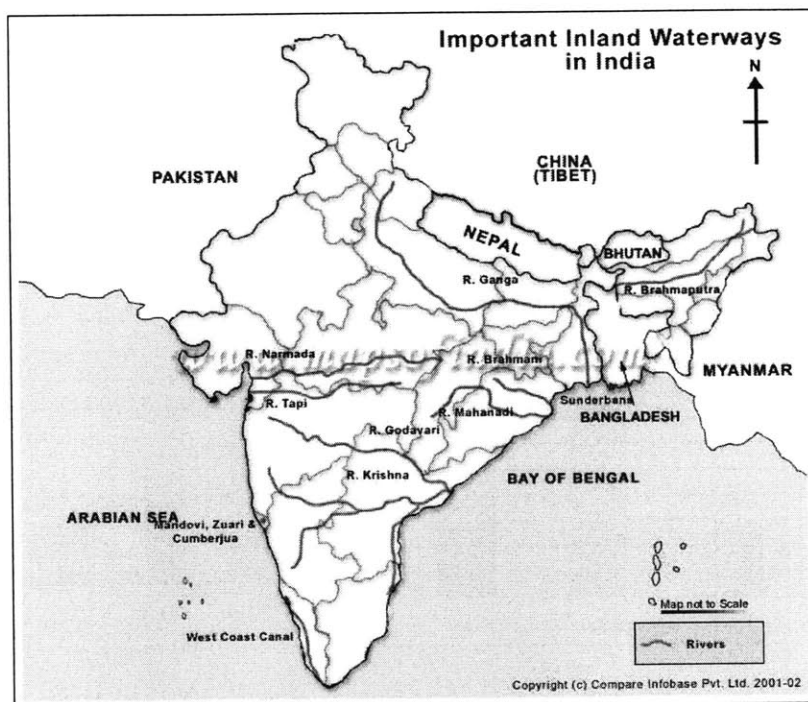


Figure 3-6: Important waterways in India [20]. Only three of them have been exploited till now.

2. Hindustan Shipyard Limited at Vishakapatnam
3. Hooghly Dock and Port Engineers at Kolkata
4. Garden Reach Shipbuilders & Engineers Limited at Kolkata
5. Mazagon Dock Limited at Mumbai and Nhava
6. Goa Shipyard Limited at Vasco-Da-Gama

Privately Owned:

In addition, India also have some recently started private shipbuilding yards:

1. ABG Shipyard at Surat
2. Bharati Shipyard Limited at Ratnagiri and Ghodbunder
3. Larsen & Toubro Shipyard and Offshore Works at Hazira
4. Dempo Shipyard at Old Goa and Zuari
5. Chowgule & Company Limited Shipbuilding Division at Margaon

6. Alcock Ashdown Company Limited at Bhavnagar

Shipbuilding industry in India is characterized by the presence of heavily subsidized government yards, lack of ancillary industry, lack of scale, endless bureaucracy and lack of experienced designers & R&D, and confined to building small to medium sized vessels and specialized crafts.

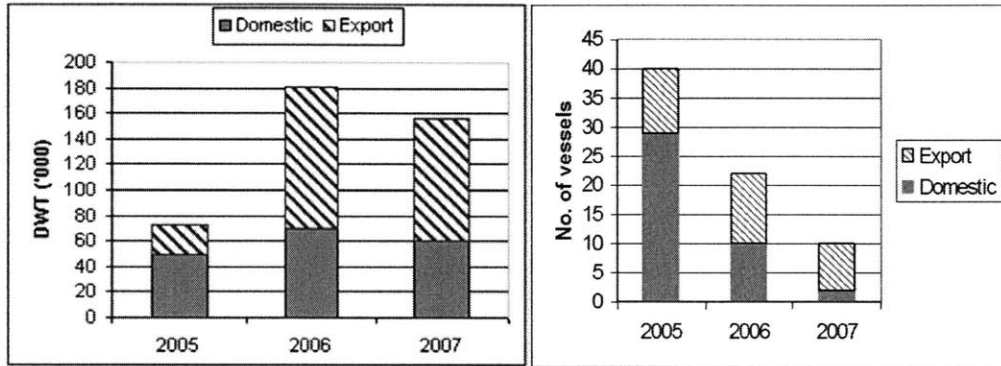


Figure 3-7: Vessels constructed and exported from Indian yards; *Left*: Dead weight tonnage exported; *Right*: Number of vessels exported [17].

3.3.2 Ship Breaking in India

India is well known for its ship breaking industry. The biggest ship breaking yard in the world is located at Alang in India [48]. In the year 2001, India handled 42% of the vessels while China handled 4% of the vessels [48].

Country	1991	1992	1993	1994	1995	1996	1997	1998*
Bangladesh	940	2284	2594	3947	4915	4231	2978	3163
	20%	13%	14%	19%	33%	26%	22%	21%
China	374	8921	9318	3397	676	1331	164	979
	8%	52%	52%	16%	5%	8%	1%	7%
India	1079	3140	2949	5917	4868	7851	7577	7427
	23%	18%	16%	29%	33%	48%	55%	49%
Pakistan	1280	1609	1921	5301	3623	2043	1630	1962
	27%	9%	11%	26%	25%	13%	12%	13%
Others	22%	8%	7%	10%	4%	5%	10%	10%
Total	4685	17228	17982	20714	14677	16313	13744	15021

* Jan-Sept 1998

Ship demolition by location in 1000 DWT
Source: Drewry Shipping Consultants, 1998

Figure 3-8: Ship breaking by location [48].

Chapter 4

Comparative Analysis of Maritime Sector in India

The *levels of service* (LOS) in the transport sector have significant contribution on the competitiveness of both goods and services [61] produced by a nation. Similarly competition and increased efficiency in maritime transport services, resulting in lower freight rates, contribute directly to a country's international competitiveness. Maritime transport services are characterized by being capital intensive and are typically operated only if there are economies of scale to allow for profitable operations.

As described in Chapter 3 the costs associated with moving cargo in India is one of the highest in the world at 11% of landed cost, compared with a global average of 6%, according to a Drewry/NOL report [11]. New shipbuildings usually takes much longer time than global averages and represent only 0.42% of world order book. India lags behind other major economies in containerization with its largest container port (JNPT) handling a tenth of Hong Kong and its shipping companies having very few ships carrying containers. In comparison, China's growth in a maritime context is certainly more impressive than its South Asian neighbor. China has some of the biggest ports in the world (Hong Kong, Shanghai, Shenzhen, Guanzhou), big shipping companies (COSCO, China Shipping) and big shipyards (China Shipbuilding Industry Corporation and China State Shipbuilding Corporation).

In this Chapter, the maritime attributes of India are analyzed under two major headings: effective use of *non-living resources* and *living resources*. The aim is to understand why the maritime sector in India lags behind that of China by a considerable amount.

4.1 Non-living Resources

Government Policy, Institutional Framework & Organizational Discipline

After independence, the requirement of large-scale investment, long gestation periods, uncertain returns, associated externalities together with social objectives such as consumer protection, welfare and equality have resulted in government monopoly in transport services. The government owned, operated and financed the transport sector and success and failure in the provision of such services was largely a story of government's performance. There were various restrictions on private participation. During that period, the performance of these sectors was marked by monopoly induced inefficiency and low productivity and resulted in steadily declining share of India in world trade.

A major factor for the performance lag of Indian maritime sector compared to Far-East Asia can be attributed to poor choice of governmental policies, institutional support for implementing and enforcing the policies. The following reasons are isolated for discussion:

- Much of the maritime sector as seen from Chapter 3 (eg: shipbuilding, ports, shipping) are still owned by the government. This has resulted in the following problems of:
 - Inadequate funding from the government for growth.
 - Reduced levels of responsibility and accountability.
 - High levels of bureaucracy leading to low speeds of implementation.
 - Confusion in decision making due to conflicting economic and social objectives.

In addition, the land-side and the maritime infrastructure prior to the economic liberalization, was built and maintained by the government and did not allow for the scales of operation for extracting profits. The lack of government's long term planning has led to an abysmal physical infrastructure. Infrastructure woes will be dealt with greater detail in another section.

- Irresponsible fiscal management by the government has resulted in expensive capital and debt for both the government and the private companies in India.
- Policy making in India is divided among various government levels (central, state, local). These divisions of power complicate the investment climate for investors both private and public. This causes:
 - Increases the transaction costs and risks for private investors.
 - Complicates and reduces the synergy between various governments policies.

- Consistent with the ethos of multi-party democracy, typically no single party in India wins an absolute majority and has to rely on a coalition which often results in clash of interest, priority and implementation issues in formulating a policy. In many cases, the policies often lose their tooth by the time a consensus is reached. For example, Indian government faces stiff opposition from communist parties against privatization of SCI, and in other cases the bureaucratic delays resulted in government obtaining reduced values during the disinvestment process.
- Unlike in China which enjoys political continuity, governments in India keep changing. The changing political climate makes it difficult to take decisions leading to uncertainty reducing investments from businesses.
- Government has allowed private entrepreneurs to start new SEZs and EPZs in India but with much limited scope and scale.
 - Almost all of the SEZs allowed are too small and geographically separated to allow for the economies of scale required for efficient maritime operations similar to Shenzhen or Guangzhou in China.
 - No special labor flexibility in the SEZs.
- There is a lack of consistent set of government policy to extract the maximum synergy between the various interlinked systems and processes. There is no clear cut well coordinated policy on providing inter-modal movement of goods from the ports to the hinterland or vice-versa.
- India has not been able to leverage its labor resources to the fullest. The blame is partly on the government for not formulating policies for better labor management and labor reforms which will allow fully utilizing these resources. More details in Section 4.2.
- Government of India's taxation policy has also discouraged maritime activities in India. This will again be discussed in Section 4.1

Since the liberalization of the 1990's, the government of India has undertaken various initiatives for all round development of maritime sector to compete with the global leaders. These include:

- Reform measures in maritime transport services like privatization were introduced. It was expected that privatization would increase efficiency through competition, reduce the financial constraints and speed up the process of adaptation of new technologies.

- Public sector shipyards will be given same freedom for procurement to make comparable with the private sector.
- The major ports were allowed to enter into joint ventures with minor ports, foreign ports and foreign companies to boost coastal shipping.
- An empowered Committee on environmental clearance (ECEC) was constituted in the Ministry of Shipping to provide simplified and transparent guidelines for environmental clearance.

Creation of Centralized Directorate General of Ports (DGP)	Synergetic Development of Major & non-major ports	National Seaways to be developed on the lines of NHDP	Regulated competition – to encourage inter-port and intra-port competition
Integrated approach to multi-modal logistics	Port modernization as per international port sector benchmarks	Support to port specialization, inter-port complementarity	Open tendering for all dredging works instead of nomination
Central Govt. to help State Maritime Boards for developing minor ports	SPVs and Joint ventures for taking up port connectivity projects to be encouraged	New normative approach to port tariff policy in place of cost plus method	Differentiation to be made between captive and multi user terminals based on needs
Corporatisation of ports with greater say for port users	Select ports to be declared as SEZs with private sector participation	Offshore handling of oil cargo through SPMs to be encouraged	More transparent port land policy and reasonable prices

Figure 4-1: Highlights of the new port policy as envisioned by the government of India [13].

- Various fiscal incentives for the promotion of shipping, ocean trade and ship building, container manufacturers by providing:
 - Loans at very low interest rates from government controlled banks.
 - Grants to promote a specific trade, or develop a specific skill set.
 - Exemption of shipping companies from the minimum alternative tax if they transfer an amount that is twice the aggregate of the paid up capital, general reserve and share premium reserve to a special account meant for ship acquisition.
 - Introduction of tonnage tax.
 - A 30% subsidy for all vessels which will be exported and for domestic orders of vessels of length greater than 80m.
 - 100% FDI is allowed in shipbuilding and encourages formation of joint ventures.
 - Easier foreign exchange for speedy import of capital goods, spares and ship repair/dry docking for Indian companies.

It is expected that these policies enacted a decade after the economic liberalization will bring about a slow but marked change in the future of maritime sector in India.

Physical Infrastructure

Increased trade and transportation activities generate the demand for better maritime transportation infrastructure. As described earlier, Indian maritime transportation industries suffers from under-capacity, productivity and hence inefficient leading to long lead times, higher costs and reduced competitiveness.

Costs and productivity issues are largely the result of an inadequate physical infrastructure to support India's greater participation in the global supply chain and World trade in general. Several publications have identified this lack of physical infrastructure as the single biggest constraint on the growth of Indian maritime sector [60, 52, 4, 11]. First, the infrastructure constraints in maritime sector are isolated as given below:

- *Depth Constraints:* India still lacks ports with adequate water depth which will allow modern ships to dock and transfer cargo. Only Mundra having depths in excess of 14m (Pipavav, JNPT, Mumbai have 13m, Haldia having 12.2m, Chennai 13m). Due to this constraint, only feeder ships arrive in the Indian ports and transship the cargo via ports like Colombo or Singapore or Klang. However things are poised to improve with deep water facilities planned at both Kochi and Tuticorin closest to the East-West route, with a transshipment terminal under construction in Kochi. Allowing private sector participation in dredging sector previously under the monopoly of Dredging Corporation of India should alleviate the situation also.
- *Lack of Terminal Capacity & Pre-berthing Time:* Indian ports were not designed to handle the amount of cargo handled currently due to constraints in cargo handling, terminal capacity and cargo dispersal mechanism (refer Table 3.3). This can be seen from the long pre-berthing time required for vessels. Due to long pre-berthing time, large vessels with significant capital investments find it expensive to call in Indian ports.
- *Lack of Supporting Secondary Infrastructure:* To streamline the process of cargo movement from the ports quickly and efficiently require secondary supporting infrastructure like railways, highways and waterways. India lags far behind that of China in developing secondary infrastructure to allow for an efficient multi-modal transportation infrastructure. Table 4.1 compares the secondary transportation infrastructure of China and in India.

- *Highways*: India has around 2.4 million km in its paved road network in comparison with China’s 1.4 million km long paved road network. Efficient transport of freight through road require 4/6 lane highways and expressways in which India (4,885 km expressways) lags behind China (at least 29,745 km expressways). To improve the situation, government has embarked upon a highway building program called golden quadrilateral highway project (highways linking Delhi-Mumbai-Chennai-Kolkata and major ports) as depicted in Figure 4-2 [62, 35].

	China	India
Railways		
Total	71,898 km	63,230 km (16,693 km electrified)
Standard gauge	71,898 km 1.435-m gauge (18,115 km electrified)	
Broad gauge	-	45,718 km 1.676-m gauge
Dual gauge	23,945 km (multiple track not included) (2002)	-
Other gauges	-	14,406 km 1.000-m gauge; 3,106 km 0.762-m gauge and 0.610-m gauge (2004)
Highways		
Total	1,809,829 km	3,851,440 km
Paved	1,447,682 km (at least 29,745 km of expressways)	2,411,001 km
Unpaved	362,147 km (2003)	1,440,439 km (2002)
Waterways		
	123,964 km (2003)	14,500 km note: 5,200 km on major rivers and 485 km on canals suitable for mechanized vessels (2005)

Table 4.1: Transportation infrastructure in China and India (July, 2005) [30].

- *Railways*: Indian railways is the second largest in the world under a single management. However, Indian railways suffers from track congestion, shortage of rail cars and capacity limitations in container depots. This has led to increased turn around and pre-berthing waiting times for carriers, and lead time for exporters and importers. Further, the present costs for moving freight by rail (measured by tonne/kilometer) in India is three times that of China [60]. Improvements proposed to railways include 1) a dedicated 9260km, \$14 billion freight rail corridor parallel to the golden quadrilateral highway (refer Figure 4-2); 2) Ending government monopoly in container transport by allowing private participation.
- *Waterways*: India’s navigable (and potentially navigable) inland waterways comprise almost 14,500 km, of which 5,200 km of major rivers and 485 km of canals are suitable for mechanized craft. But inland water transport in India accounts for 0.15% (1.5 billion tonne km) of domestic transportation (900-1,000 billion tonne km) per annum. This efficient means of transport is key in bringing competitiveness to Indian manufacturing. Proposed improvements include intra-India shipping on the coastline and along rivers [54].

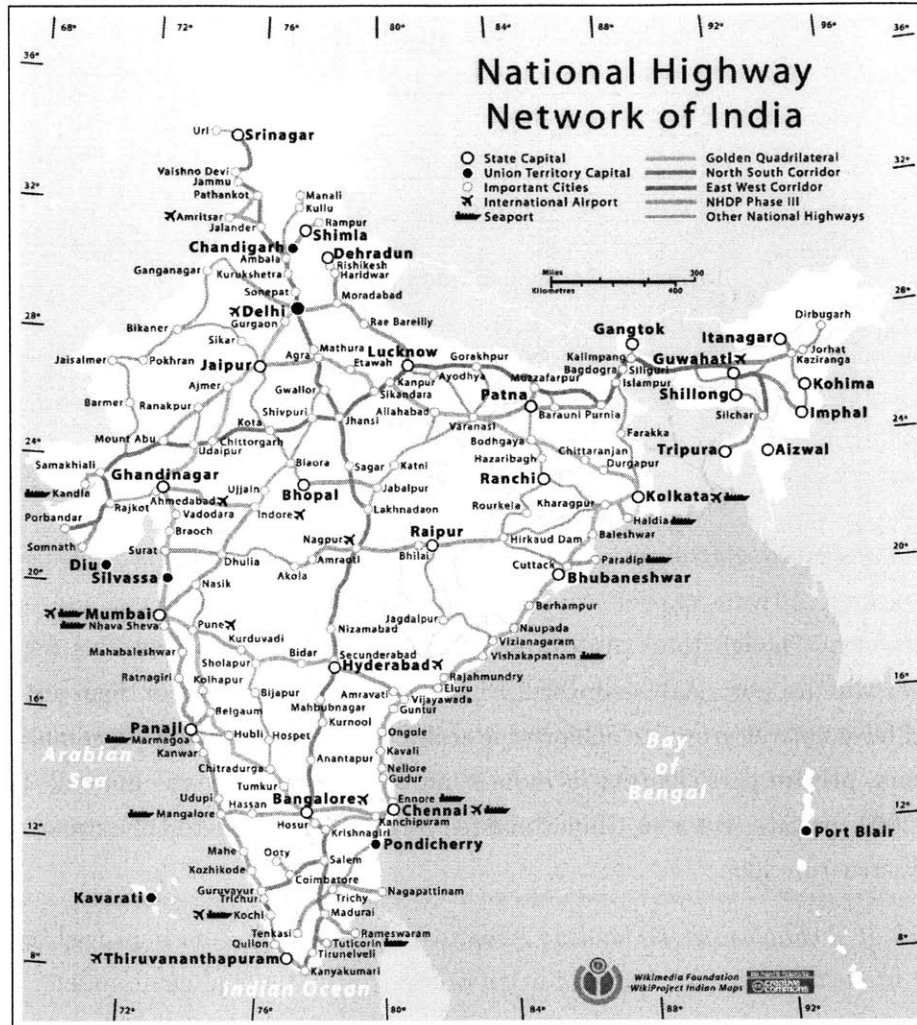


Figure 4-2: National highway development project, port connectivity map. The *Golden Quadrilateral* highway links Delhi-Mumbai-Chennai-Kolkata and major production centers to the ports.

The reasons for the deficiencies in physical infrastructure are given below:

- *Reduced Trade Prior to Liberalization:* Prior to the 1990s, India's economy was virtually closed from the global economy, a period where the international trade stagnated as a result of which her share of world trade shrank from 2.4% in 1951 to 0.5% in 1990 as depicted in Table 4.2. This reduced demand for infrastructure needed for maritime transport services, as these services operated at a scale which will not allow for profitable operations to benefit from the cheap man power resources in India. India was not ready for the sudden increase in traffic following the economic liberalization.
- *Lack of Investment:* Though great strides have been made in increasing investment,

Fiscal year	Percentage of world trade
1951	2.4 %
1980	0.4 %
1990	0.5 %
2004	0.9 %

Table 4.2: India's share of World trade [30].

deficiency in capital remains the single biggest reason for the current poor performance of the infrastructure sector. In 2003-2004, China's annual investment in infrastructure (US\$201 billion or 9% of GDP) has been seven times that of India (US\$28 billion or 3.6% of GDP).

- *Lack of Private Participation:* Private participation in Indian maritime sector is yet to pickup. Private participation can allow for better management and operational efficiency. Though there are examples of highly profitable operations (eg: Pipavav port, Mundra port, ABG shipyard, Bharti shipyard etc.), most of them are quite new and have not yet grown to achieve the scales to compete globally. In comparison with China, private participation in India's infrastructure building is limited. From 1990 to 2003, private sector in China invested 9 times private sector investment in Indian infrastructure [60].
- *Lack of Technology & Technology Adoption:* New, reliable, and improved technologies are a must to improve value addition of services in a global environment. India has lagged in the adoption of the state of the art technologies in the maritime sector. There still exists a serious lack of domestic technology in not just building building infrastructure but in using and maintaining it.
- *Lack of Management Skills:* A problem which has been more significant than the lack of technological knowledge has been the limitation of management of technologies and management of infrastructure. Unlike China which had maritime management expertise from Hong Kong, India was not fortunate enough.
- *Lack of Scale in Shipping Industry:* Indian shipping, as it exists today, is marked by the presence of a few large and medium sized national shipping companies and a host of private players that together carry around 30% of the country's overseas trade. The homegrown players has lagged behind the major global players in scope and scale required to compete against them. Part of the issue is due to the limited nature of tax exemption which Indian companies enjoy. Further, unlike Hong Kong which was a major center for shipping, India had no similar advantage.

- *Lack of Efficient Shipbuilding and Ancillary Industry:* Shipbuilding in India lacks the scale and is hence not competitive in cost and in delivery time. Further, most of the major shipyards are government owned and was heavily subsidized to remain open (until the recent boom). Even the steel required for building a ship had to be imported. Heavy dependence on import of machinery, steel and other equipments for Indian shipbuilders would considerably increase the variability in procurement time and often led to huge lead time for the customer. Korea is the current leader in the shipbuilding industry and has 40% of market share followed by Japan with 34% and China with 15%. However, Korea has 14 big shipyards compared to that of the Japanese or Chinese yards. In contrast, India is way behind with only 7 yards of which only two yards, Cochin Shipyard Ltd (CSL) and Hindustan Shipyard Ltd (HSL) are capable of building average and above average size of ocean-going merchant vessels (refer Table 4.3).

- As on 2005, the Indian order book of 91 ships corresponds to about 2% of the world order book of 4712 ships (977,400 DWT corresponding to 0.42% of world order book of 230 million DWT). As seen from the Figure 4.3 India has risen to the rank of 8th in terms of order book globally.

Rank	Country	No. of Yards	No. of Ships	DWT	Average DWT of a Ship
1	South Korea	26	1160	82,179,410	70,844
2	Japan	63	1062	75,185,562	70,796
3	China	70	969	43,648,876	45,045
4	Germany	18	215	4,543,061	21,131
5	Vietnam	8	82	1,583,600	19,312
6	Netherlands	13	139	1,125,230	8,095
7	Russia	13	63	1,069,581	16,977
8	India	7	91	977,400	10,741
9	Turkey	23	111	970,834	8,746
10	USA	15	42	865,982	20,619

Source: i-maritime study Based on Clarksons

Table 4.3: Order book ranking of major shipbuilding nations in 2004-2005 [18].

- *Lack of Strong Political Will & Shortsighted Policies of the Government:* Being a democracy require an approach which is consensual in nature. This has been a strong detriment to the improvement of physical infrastructure and the necessary investment. For example the government needs to please a variety of stakeholders ranging from environmentalists, current residents, media etc. before making a decision like the maritime sector which require substantial investments. In many cases there are difficulties after a part of the construction has already completed. However recently

a coherent set of policies was formulated. Enforcing and implementing the policies is important and keenly awaited.

In short, India was not ready to take on increased trade. This has led to an inefficient and capacity constrained Indian maritime infrastructure. This negatively influenced the overall performance of the maritime sector. A vicious loop of investments and returns and investments was created from which India is trying to escape.

Geography & Natural Resources

The Indian peninsula, situated in the Indian Ocean, is also strategically located between the Atlantic Ocean in the west and the Pacific Ocean in the east. India is also located close to the main east-west shipping lanes (refer Figure 4-3). India is strategically located in the center of economic activity in China, South-East Asia and Middle-East. This offers significant opportunities for building transshipment terminals and trade in general.

India has roughly one third of China's area as shown in Table 2.6. However, unlike China where a large portion of the land is hilly, India is blessed with a more smooth terrain. India

	China	India
Total Area	9,596,960 sq km	3,287,590 sq km
Land Area	9,326,410 sq km	2,973,190 sq km
Water Area	270,550 sq km	314,400 sq km

Table 4.4: Area of India and China [30].

is also blessed with a larger water area, and a more uniform distribution of ocean on both the west and the east than China. It has a very long 7,000 km long coastline [30] which offers significant maritime resources and opportunities. Several locations on the coast line offers drafts of the order 16m. India has limited waterways and has not yet utilized its network of rivers and canals for efficient transport of goods.

India is blessed with several mineral resources including coal (fourth-largest reserves in the world), iron ore, manganese, mica, bauxite, titanium ore, chromite, natural gas, diamonds, petroleum, limestone. India is one of the biggest producer and exporter of iron ore in the world. India has a large area of arable land which can potentially allow India to be big player in processed and semi-processed food products.

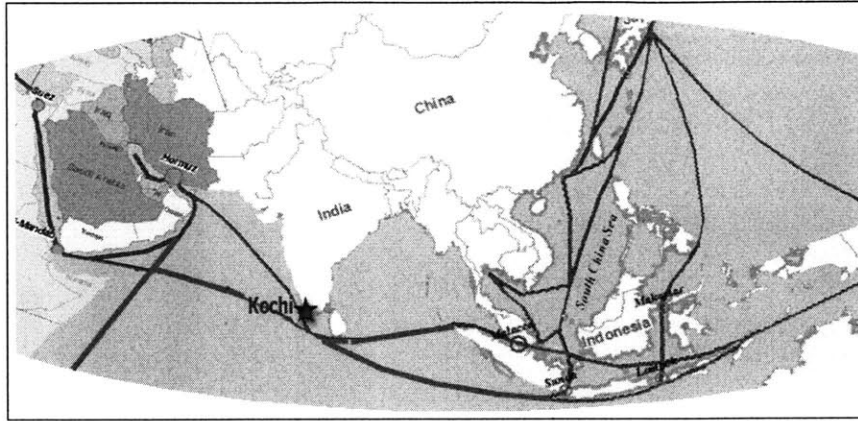


Figure 4-3: India is strategically located on the main east-west shipping lanes.

Financial & Banking Systems

Similar to the case with China, India has seen increasing domestic savings (refer Figure 4-5) albeit from a much lower base level. The latest estimates place the saving rate at 28.1% in 2003-04 against 26.1% in 2002-03, and 23.4 per cent in 2001-02.

However, India suffers from an acute shortage of investments. Typically for a developing economy like India's, achieving an 8% GDP growth require an investment of about 32% of GDP. This results in an investment gap which will decrease the GDP growth rate. This gap in investments have had a negative impact on the maritime sector as well. To be noted is the fact that the China's ratios of domestic savings and investments to GDP are nearly two times that of India [8].

Unlike China, which enjoys steady Foreign Direct Investments (FDI) of the tune of US\$53.5 billion in 2004 [5], India has been able to attract US\$4.3 billion. There is however a recent sprout in the FDI to India. During the first half of 2005-06 fiscal, India attracted US\$7.96 billion more than three times the FDI of US\$2.38 billion during the corresponding period in 2004-05 [14]. The increased investment is expected to turn into assets and better maritime infrastructure in a few years.

India has however been much more efficient in utilizing its investments. The GDP growth per unit of investment is higher in India than in China. But, the fact remains that the growth in GDP and maritime infrastructure and business remains under-funded.

Indian financial institutions are more sophisticated than China's, and India boasts of a vibrant capital market with over 9000 listed companies [14]. However, unlike in China, where the government's control of the financial system has resulted in banks with huge non performing loans, India's banking and credit system is much more conservative and risk averse. Further, there is no synergy between the government policies and the banking sector. The above factors has also led to an under funding in maritime sector.

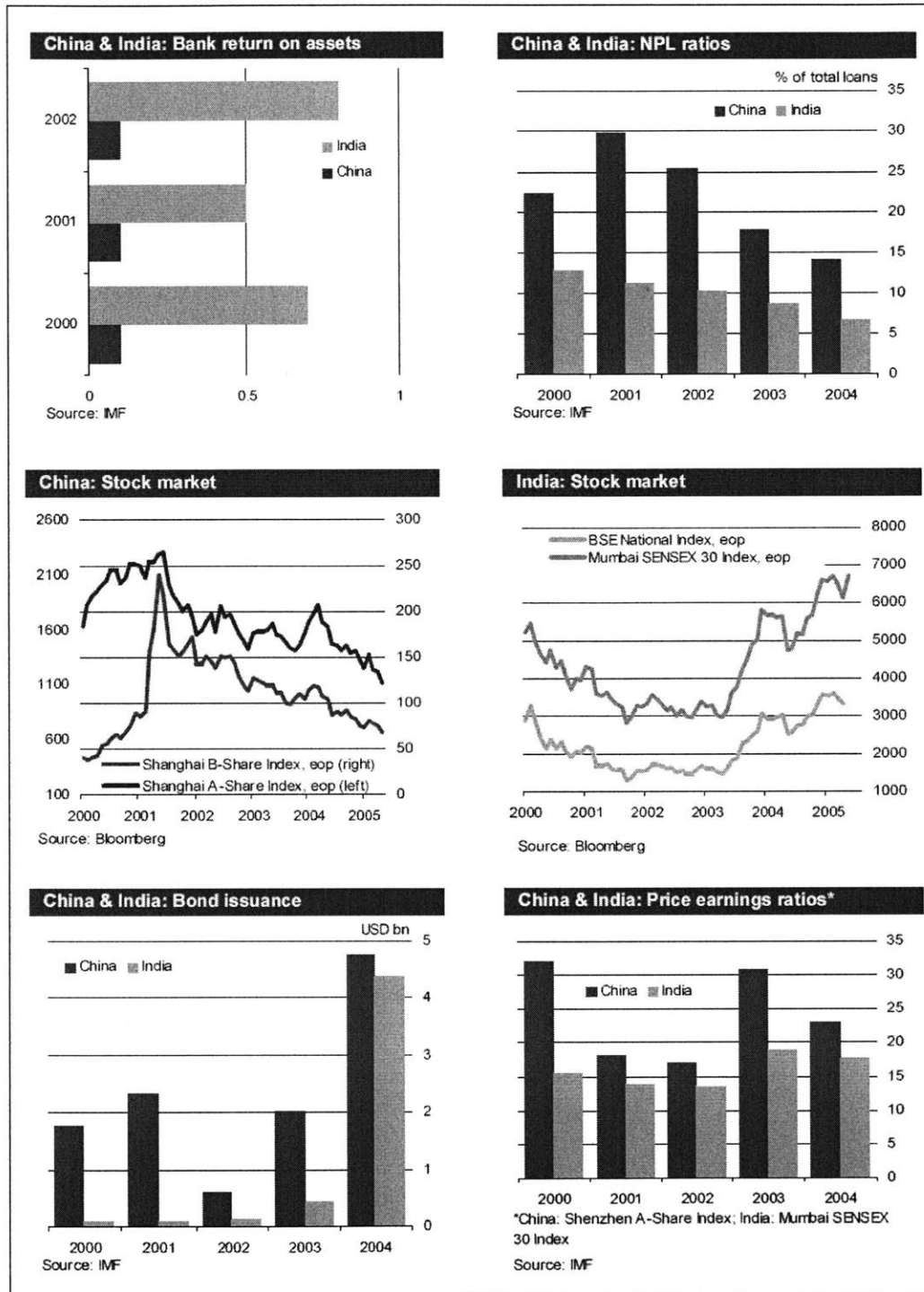


Figure 4-4: A snapshot of banking sector & financial markets of India in comparison with China [8].

Tax & Tariff Structure

Taxation plays a significant role in determining the level of investment, and a burdensome tax regime is a disincentive to investment. The tax system in India prior to the

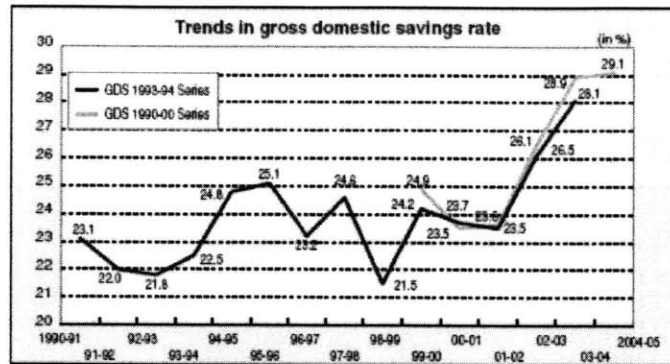


Figure 4-5: Increase in India's savings rate [39].

economic reform was confusing, overlapping and did not support increased investments or wealth creation. However, after the start of economic reforms, India has been moderately successful in reforming its tax system. The discussion will be made under the following headings.

- *High Corporate Taxes:* India had fairly high corporate taxes (effective tax rate of around 22%) in the maritime sector which lends itself unattractive compared to countries with proactive tax regimes (around 94% of world shipping is under low tax regime).

New tax laws after the 1990s grant public Indian shipping companies a tax holiday on profits. This is however subject to conditions of:

- The profits will be utilized for acquiring new ships or for shipping.
- There were certain caps on investments.
- Such amounts were retained in India.

- *Inequality in Personal Income Tax:* The Indian taxation regime is not friendly toward personnel either and imposes additional costs making employment on Indian ships unattractive. Indian officers and crew employed on Indian flagged vessels (for a period of less than 183 days) are subject to income tax. No such taxation requirement is imposed on foreign flags making employment on these flags more attractive. This means that Indian shipping companies are not able to retain quality manpower in India.

- *Introduction of Tonnage Tax:* In 2004 India introduced tonnage tax as a substitute for corporate tax. Prior to that shipping companies registered their ships through subsidiaries in open registry tax havens (eg:Liberia, Panama). This has boosted the

Indian shipping industry which crossed 8 million GRT in 2005 after stagnating around 6 million GRT for 25 years.

- *Introduction of Value Added Tax:* In April, 2005 India made the first major step by introducing a comprehensive VAT regime. Though not directly related to maritime sector, introduction of VAT will bring forth transparency in tax collection, a rationalized tax structure, help curb tax evasion and add more revenue to the state exchequer. This will however boost the exports as goods for export will tax exempt. Further a VAT regime will boost big corporations and benefit the manufacturing sector.
- *Hong Kong as a Tax Haven:* Unlike shipowners in China who take advantage of tax relief from Hong Kong, India offers no such tax haven. However, there is a recent proposal to construct a specific economic zone near Mumbai which will offer the same advantages which Hong Kong offers Chinese shipowners.
- *Tariff on Import:* India has far higher tariff structure for importing machinery and high tech equipment for manufacture than China. This has indirectly affected the maritime sector by decreased competitiveness of Indian products.
- *Insurance Premium:* Indian ship owners are statutorily required to insure their fleet for hull and machinery with Indian insurance companies. The insurance premium rates are fixed by a government committee (tariff advisory committee) and are traditionally been much higher than those prevailing internationally.
- *Enforcing and Collection of Taxes:* India is also not as efficient as China in enforcing and collecting the taxes.

4.2 Living Resources

Population, Demographics & Labor Costs

Similar to China, India also offers labor arbitrage as seen from Table 2-7. The labor force of India is 0.7 times the labor force of China and 3.3 times that of the US. By 2010, India will be the only country to have a favorable demographics (earning population is more than those dependent). This will make India the world's youngest nation [36]. However, India needs to find 71 million jobs, the addition to its working-age population from 2006 to 2010, addition of labor force equal to that of Russia.

India has not been as efficient as China in converting this arbitrage to production. Between 1994 and 2000, for 1% increase in GDP, employment rose by 0.16% only [36]. Further, during the period 1993-2001, 53% of adult Chinese worked while only 37.7% of

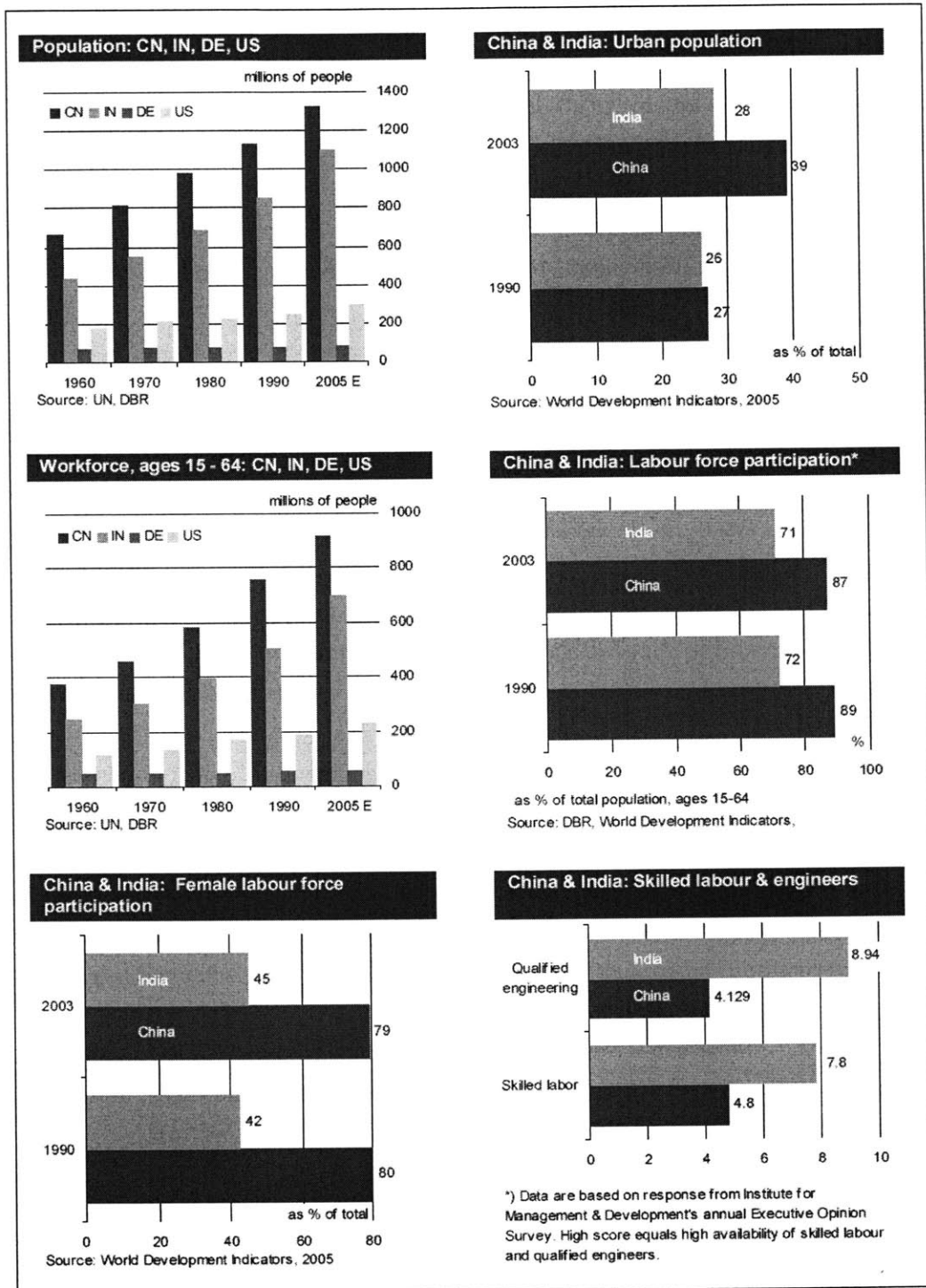


Figure 4-6: A snapshot of population & labor force of India in comparison with China [8].

Indians worked. The difference is mainly due to the participation of women arisen due to cultural factors. Modernization could allow better participation of women in the work force

in India.

Unlike China which has maintained a planned migration environment for its rural workforce, Indian cities are not able to absorb the migrating working population. However, India has the advantage of better and more uniform access to its rural areas than China due to the extensive road network (refer Table 4.1).

In China, the working conditions of people are often criticized. However in India the condition of the people are even worse due to not finding enough employment.

Trained Workforce & Productivity

India has done a great job educating a vast number of highly skilled, engineers proficient in English. As seen from the Figure 4-6, India has more skilled workers and engineers than China. Further it is easy to find many English speaking Indian officers in ships. However, most of the engineers are in the information technology industry with very few institutions in the maritime industry.

Further, the local shipbuilding industry does not have an adequate resource pool to setup a complete design and manufacturing cycle and leaves gaps in technology. This is reflected in the fact that several Indian engineers work in major shipyards in Korea, Singapore, Dubai and Japan.

However, success of an industry like shipping, cargo handling and shipbuilding requires several semi-skilled workers. India has lagged behind China in primary and secondary education. Further, there is a severe lack of vocational educational institutions producing blue-collar workers in the maritime sector. Further, the typical productivity of an Indian worker lags behind that of a Chinese worker in both shipbuilding and in cargo handling. This can be seen from the productivity growth of over 6% in China, while Indias productivity growth is around 3.5% in 2004.

India also lags the proximity towards the shipbuilding centers of Korea, Japan and Hong Kong which China enjoys. This results in improved transfer of knowledge and experience in shipbuilding.

Labor Laws

In India, several outdated restrictive labor laws are present. These are both restrictive and cumbersome, with over 40 separate labor-related legislations enacted by the government, many of which contradicts each other. On the rigidity labor index compiled by World Bank, India scores 48 against a score of 30 for China [37] (refer Figure 2.9). Each state government in India is entrusted with enforcing the labor laws. Thus some states offer better flexibility and have reformed the labor laws enabling higher growth.

The rigid set of labor laws have given rise to outsourcing critical functions in the maritime sector in India. These laws create a barrier which will not allow full utilization of India's human resource. Several experts have claimed that a simplified set of labor laws is the need of the hour for India. Such a simplified set of labor laws can unleash the untapped potential of the excess human resource.

Different governments in India have all tried to make the labor market more competitive and flexible. However, the governments come under stiff opposition from labor unions and political parties. Investors find it much easier to hire and train people in China than in India due to the following specific reasons.

- Inflexible labor laws allowing almost no *hire and fire* policy.
- Unionized labor is possible and in some cases they are militant.
- Mandatory affirmative action policies for women and socially backward classes.
- No bias toward age, handicaps or qualifications are allowed.
- More awareness of worker rights and unions supported by political parties often tend to weaken the labor discipline.
- Diverse cultural background of labor can produce difficulty and inflexibility.

Shipping being a cyclical business often encounters boom cycles where a large number of employees are required and bust cycles where the employees need to be reallocated. This requires flexibility in managing labor. Investors find it much easier to manage labor in China than in India.

Unlike the Chinese government, Indian government is not successful in educating the workforce that a flexible labor law is in the interest of the workers. Also Indian government has not come up with a formal way to mitigate the difficulties encountered by the workers during the reallocation by providing adequate social security and worker welfare packages.

However, increasing cost of finding labor in China could go in India's advantage. One critical factor in the cost of labor is the current exchange rate of the Chinese Yuan and Indian Rupee. China is under pressure to revalue the Chinese Yuan, which might erase the attractiveness of Chinese labor. However, India already has a flexible rupee and is under no revaluation pressure.

Influence of External Issues, International Politics

Clearly, the long needed economic reforms in India were an outcome of a crisis due to the collapse of the erstwhile Soviet Union and the first Gulf war. Since then several

global geopolitical factors have improved India's ties with many countries around the World. Further, India is strategically located in a region experiencing strong economic growth and is adjacent to China, Middle East and South East Asia.

India has since enjoyed a rapid growth in bilateral ties both political and economical with the US. The ties were a bit strained by the India's testing a nuclear device in 1998. But since then, a fresh maturity has come in the relations between India and China in addition to its relation with other major World powers. September 11, 2001 terrorist activity in US also saw the US and India reaching a common ground for fighting terrorism.

In addition, US has been wary of China's growing economic influence over its neighbors. US worries that the economic clout will inevitably lead to political and further military influence. This has resulted in the US classifying China as a strategic competitor and is ever more careful of Beijing's political and military ambitions.

India is viewed as fledgling democracy which is not aligned to any particular nation. Further major economies of US, Japan, EU, South Korea and Taiwan who account for a majority of foreign investment in China have started diversifying their investments and sourcing to India. These countries view this opportunity as a way to manage China and India views this as an opportunity for economic benefit. With hi-tech equipment trade from US to China not allowed, US views India as an important market.

Similar to China, India also have diaspora active in several countries. The diaspora has had a particular hand in bringing investments and know-how for in the maritime sector as well.

These external factors have all led to significant increase in investments, imports, transfer of modern technology and management skills to Indian maritime sector.

Chapter 5

Potential Impact of Indian Economic Growth on Global Shipping

In 2004, the shipping industry across all shipping sectors (container ships, tankers and dry bulk) enjoyed its most successful period in a generation. The overseas transport rates were at their highest ever. This boom in shipping has been attributed to Chinese economic growth right after it was inducted into World Trade Organization (WTO) in late 2001. The specific reasons were the sudden increases in:

- Merchandise exports from China.
- Commodity (crude, iron-ore) imports to China.

Due to heavy demand for commodities at home, China which previously exported commodities to nearby Japan and South Korea started importing the same commodities. Carriers now had to satisfy the demand for commodities from both China and Japan from Australia, Brazil, India and South East Asia. The result was a sudden increase in the ton-miles covered by the carriers.

The extent of the increase (ton-miles) from 2002 to 2004 was underexpected by most carriers leading to a stark difference between demand and supply. This has led to historic rates for transporting cargo by the ocean.

This chapter will evaluate if a similar boom in shipping market would be caused due to the potential economic growth in India. This chapter also predicts the conditions which would result in another shipping boom for each cargo type separately.

5.1 Impact on Container Shipping

The analysis is performed over a period of 4 years (2001-2004) over which the growth rates in containerized cargo from China increased by 67% and led to a boom in shipping prices.

Table 5.1 reproduces the containers handled by China, India and World over a period from 2001 to 2004. All the data are obtained from Containerization International Yearbooks [3, 12, 32]. In 2004, the number of containers handled in Chinese ports (75 million TEU) is 17 times the number of containers handled in Indian ports (4 million TEU).

One can easily observe that over this time period from 2001 to 2004, the number of containers handled in the world increased by 38%. Of the 38% increase in container traffic worldwide, 12% was due to increased traffic in China and only 1% attributed to India. That is over the four year period, nearly 33% of the container handling growth in the world was due to China. It was this huge increase in Chinese traffic that caught the container shipping industry by surprise, leading to increased utilization and sudden increase in prices.

Cargo Type	Volume (TEU)				Net Change (TEU)	Change Relative to World Total in 2001 (%)
	2001	2002	2003	2004	(2001-2004)	(2001-2004)
China	44726085	55717490	61621500	74540144	29814059	12%
India	2764757	3242989	3916064	4265910	1501153	1%
World	243814545	276652859	303108850	336858116	93043571	38%

Table 5.1: Containers handled ports in China, India and World from 2001 to 2004 [3, 12, 32].

A similar impact on prices may be expected if the container traffic in India over a 4 year period results in a growth similar to the double digit growth experienced by China (12%). We perform an analysis to see, when the container handling in India attains this critical number.

As depicted in Table 5.2, various scenarios are simulated based on the growth of containers handled in: 1) the world (5%pa to 13%pa), and 2) India (10%pa to 35%pa). For each combination of the assumed global and Indian growth rates, we first obtain the container volumes over over 2005-2025. Next, we find the increase in containers handled in India (over a similar 4 years) relative to the containers handled worldwide. This should give a measure of the relative increase in India's contribution and a possible indicator of another container shipping boom.

5.1.1 Simulation Results (Container Traffic)

As one can observe from Table 5.2, an impact similar to China is observed only for select combinations of global and Indian container handling growth rates. The specific observations are given below:

- The earliest realistic date for a similar impact is 2014, and this happens when the shipping community assumes a global container handling growth rate of less than 6%pa, and an Indian container handling growth rate of nearly 35%pa.
- For Indian container handling growth rates below 20%, another boom in the container shipping is not expected. However, another boom can happen if both China and India overperform.

	Case No.	Assumed Container Handling Growth		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
		World	India																								
Case 1	Case 1-1	5.0%	10%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 1-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	3%	3%
	Case 1-3		20%	2%	2%	2%	1%	1%	1%	1%	1%	2%	2%	2%	2%	3%	3%	4%	4%	5%	5%	6%	7%	8%	9%	10%	10%
	Case 1-4		25%	2%	2%	2%	1%	1%	2%	2%	2%	2%	3%	3%	4%	5%	6%	7%	8%	10%	12%	14%	17%	20%	23%	28%	28%
	Case 1-5		30%	2%	2%	2%	2%	2%	2%	2%	3%	4%	4%	5%	7%	8%	10%	13%	16%	20%	24%	30%	37%	46%	57%	71%	71%
	Case 1-6		35%	2%	2%	3%	2%	2%	3%	4%	5%	6%	8%	11%	14%	18%	23%	29%	38%	49%	62%	80%	103%	133%	170%	170%	170%
Case 2	Case 2-1	6.0%	10%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 2-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	3%	3%	3%	
	Case 2-3		20%	2%	2%	2%	1%	1%	1%	1%	1%	2%	2%	2%	2%	3%	3%	4%	4%	5%	5%	5%	6%	7%	8%	9%	
	Case 2-4		25%	2%	2%	2%	1%	1%	2%	2%	2%	3%	3%	4%	5%	5%	6%	7%	9%	10%	12%	14%	17%	20%	23%	23%	
	Case 2-5		30%	2%	2%	2%	2%	2%	2%	2%	3%	3%	4%	5%	6%	8%	10%	12%	14%	18%	22%	26%	32%	40%	49%	60%	
	Case 2-6		35%	2%	2%	3%	2%	2%	3%	4%	5%	6%	8%	10%	13%	16%	21%	26%	34%	43%	55%	70%	89%	113%	144%	144%	
Case 3	Case 3-1	7.5%	10%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 3-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	
	Case 3-3		20%	2%	2%	2%	1%	1%	1%	1%	2%	2%	2%	2%	3%	3%	4%	4%	4%	4%	4%	5%	5%	6%	6%	7%	
	Case 3-4		25%	2%	2%	2%	1%	1%	2%	2%	2%	3%	3%	3%	4%	5%	5%	6%	7%	9%	10%	12%	13%	16%	18%	18%	
	Case 3-5		30%	2%	2%	2%	2%	2%	2%	3%	3%	4%	5%	6%	7%	8%	10%	12%	15%	18%	22%	26%	32%	38%	46%	46%	
	Case 3-6		35%	2%	2%	3%	2%	2%	3%	4%	5%	6%	7%	9%	11%	14%	18%	23%	28%	36%	45%	56%	71%	89%	112%	112%	
Case 4	Case 4-1	9.0%	10%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Case 4-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	
	Case 4-3		20%	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	3%	4%	4%	4%	4%	5%	5%	
	Case 4-4		25%	2%	2%	2%	1%	1%	2%	2%	2%	2%	3%	3%	4%	4%	5%	5%	6%	7%	8%	9%	11%	12%	14%	14%	
	Case 4-5		30%	2%	2%	2%	2%	2%	2%	3%	3%	4%	4%	5%	6%	7%	9%	11%	13%	15%	18%	21%	25%	30%	36%	36%	
	Case 4-6		35%	2%	2%	3%	2%	2%	3%	4%	4%	5%	7%	8%	10%	13%	16%	19%	24%	30%	37%	46%	57%	70%	87%	87%	
Case 5	Case 5-1	11.0%	10%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Case 5-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 5-3		20%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	4%	
	Case 5-4		25%	2%	2%	2%	1%	1%	2%	2%	2%	2%	2%	3%	3%	4%	4%	4%	5%	6%	6%	7%	8%	9%	10%	10%	
	Case 5-5		30%	2%	2%	2%	2%	2%	2%	2%	3%	3%	4%	5%	5%	6%	7%	9%	10%	12%	14%	16%	19%	22%	26%	26%	
	Case 5-6		35%	2%	2%	3%	2%	2%	3%	3%	4%	5%	6%	7%	9%	11%	13%	16%	19%	24%	29%	35%	42%	52%	63%	63%	
Case 6	Case 6-1	13.0%	10%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Case 6-2		15%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 6-3		20%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	
	Case 6-4		25%	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	3%	4%	4%	4%	4%	5%	5%	6%	7%	7%	
	Case 6-5		30%	2%	2%	2%	2%	2%	2%	2%	3%	3%	4%	4%	5%	5%	6%	7%	8%	9%	11%	12%	14%	16%	19%	19%	
	Case 6-6		35%	2%	2%	3%	2%	2%	3%	3%	4%	5%	5%	6%	8%	9%	11%	13%	16%	19%	22%	27%	32%	38%	45%	45%	

Table 5.2: Relative impact due to India in container shipping over the previous 4 years starting from 2004 to 2025. The shaded cells represent the region of double-digit impact and should accompany a container shipping boom.

5.2 Impact on Liquid Bulk Shipping

China was an oil exporter until 1993, when the domestic demand for energy forced it to import petroleum products. Nearly 60% of Chinese crude imports comes from the middle-east, and has recently started diversifying its crude purchases to Venezuela, Russia and Africa. This has been a factor in the increase in price of petroleum products in the global markets and a boom in the liquid bulk shipping industry.

Cargo Type	Volume (1000 Tonnes)				Net Change (1000 Tonnes)	Change Relative to World Total in 2001 (%)
	2001	2002	2003	2004	(2001-2004)	(2001-2004)
China	244,060	257,750	304,380	350,510	106,450	9%
India	105,806	108,989	115,897	124,382	18,576	2%
World	1,167,810	1,243,715	1,324,560	1,410,655	242,845	21%

Table 5.3: POL products handled by ports in China, India and World in thousands of tonnes from 2001 to 2004 [2, 34, 25].

An analysis similar to the one performed for the container shipping is presented for the petroleum, oil, and lubricant (POL) products shipping. Table 5.3 reproduces the tonnage of POL products handled by China, India and World over a period from 2001 to 2004. The data for the Chinese POL traffic is obtained from the annual report on China's shipping development [2] compiled by the Ministry of Communications, PRC. The data for India is obtained from the Indian Ports Association [34] website. The figures for the volume of POL handled globally were obtained from American Association of Port Authorities website [25]. In 2001, Chinese ports handled 244 million tonnes POL products which is 2.3 times the volume handled at Indian ports, 105 million tonnes, and this ratio increased to 2.8 in 2004. Thus China was able to outperform India and the rest of the world during this period.

On average, one observes that over this time period from 2001 to 2004, the volume of POL products handled in the world increased by 21%. Of the 21% increase in global POL product traffic, 5% was due to increased traffic in China and only 1% is attributed to India. Thus over the four year period from 2001-2004, nearly 23% of the growth in the global POL handling was due to China. Similar to the case of the container traffic, it was this huge increase in Chinese POL product traffic that resulted in increased utilization of the fleet and led to the sudden increase in shipping prices.

A similar impact on prices may be expected if the POL product traffic in India over a 4 year period results in a growth similar to the 5% growth experienced by China. An analysis similar to the one performed for container shipping is performed for POL products where

we wish to evaluate when this critical figure of 5% is reached in the case of India.

Depicted in Table 5.4, are the various scenarios simulated based on the assumed growth of POL products handled in: 1) the world (2%pa to 12%pa), and 2) India (5%pa to 20%pa). For each combination of the assumed global and Indian growth rates, we obtain the POL product volumes over over 2005-2025 and then find the increase in the POL products handled in India (over a similar 4 years) relative to the POL products handled worldwide. This metric represents the relative increase in India's contribution and a possible indicator of another liquid cargo shipping boom.

5.2.1 Simulation Results (Liquid Bulk Cargo Traffic)

From Table 5.4, one can observe that an impact similar to China is possible only for select combinations of global and Indian POL product handling growth rates. These specific combinations and their significance are given below:

- The table 5.4 is clearly able to reproduce the current boom and this boom is expected to continue until 2006 provided the rate of growth for POL product traffic in India is above 5%.
- After this, the earliest realistic date for a similar impact is 2008, and this happens when the shipping community assumes a POL product handling growth rate of less than 2%pa for world, and a growth rate of nearly 20%pa for India.
- For Indian POL handling growth rates below 10%, another boom is not expected at all.
- For realistic values of 5% growth rate for the world and 10-15% for India, one expects a liquid cargo shipping boom as early as 2012.

Further, India is building several refineries, requiring transport of crude to India and then the exporting of the refined products to the markets. In addition, China is not showing any signs of softening of its demand for crude and petroleum products.

	Case No.	Assumed POL Handling Growth Rate		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
		World	India																							
Case 1	Case 1-1	2.0%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 1-2		8%	6%	7%	7%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%
	Case 1-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	3%	3%	3%	3%	4%	4%	4%	4%	5%	5%	6%	6%	7%	7%	7%
	Case 1-4		12%	6%	7%	7%	2%	2%	3%	3%	3%	4%	4%	4%	5%	5%	6%	6%	7%	8%	8%	9%	10%	11%	12%	12%
	Case 1-5		15%	6%	7%	8%	3%	3%	4%	4%	5%	5%	6%	7%	7%	8%	9%	11%	12%	14%	15%	17%	19%	22%	25%	25%
	Case 1-6		20%	6%	7%	8%	4%	5%	6%	7%	8%	9%	11%	12%	15%	17%	20%	24%	28%	33%	39%	46%	54%	63%	75%	75%
Case 2	Case 2-1	3.5%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 2-2		8%	6%	7%	7%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	
	Case 2-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	4%	4%	4%	4%	4%	5%	5%	5%	5%	
	Case 2-4		12%	6%	7%	7%	2%	2%	3%	3%	3%	3%	4%	4%	4%	5%	5%	5%	6%	6%	7%	7%	8%	9%	9%	
	Case 2-5		15%	6%	7%	8%	3%	3%	4%	4%	4%	5%	5%	6%	7%	7%	8%	9%	10%	11%	13%	14%	15%	17%	19%	
	Case 2-6		20%	6%	7%	8%	4%	5%	6%	7%	8%	10%	11%	13%	15%	18%	20%	24%	27%	32%	37%	43%	49%	57%	57%	
Case 3	Case 3-1	5.0%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 3-2		8%	6%	7%	7%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	
	Case 3-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	
	Case 3-4		12%	6%	7%	7%	2%	2%	3%	3%	3%	3%	3%	3%	4%	4%	4%	5%	5%	5%	5%	6%	6%	7%	7%	
	Case 3-5		15%	6%	7%	8%	3%	3%	3%	4%	4%	5%	5%	5%	6%	6%	7%	8%	9%	9%	10%	11%	12%	13%	15%	
	Case 3-6		20%	6%	7%	8%	4%	5%	6%	7%	8%	9%	10%	12%	13%	15%	18%	20%	23%	26%	30%	34%	39%	44%	44%	
Case 4	Case 4-1	7.5%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
	Case 4-2		8%	6%	7%	7%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	
	Case 4-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	
	Case 4-4		12%	6%	7%	7%	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	5%	
	Case 4-5		15%	6%	7%	8%	3%	3%	3%	4%	4%	4%	4%	5%	5%	5%	6%	6%	6%	7%	7%	8%	8%	9%	10%	
	Case 4-6		20%	6%	7%	8%	4%	4%	5%	6%	6%	7%	8%	9%	10%	11%	12%	13%	15%	17%	19%	21%	23%	26%	29%	
Case 5	Case 5-1	10.0%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	
	Case 5-2		8%	6%	7%	7%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%		
	Case 5-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	
	Case 5-4		12%	6%	7%	7%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	
	Case 5-5		15%	6%	7%	8%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	5%	5%	5%	5%	6%	6%	6%	6%	
	Case 5-6		20%	6%	7%	8%	4%	4%	5%	5%	6%	6%	7%	7%	8%	9%	10%	10%	11%	12%	14%	15%	16%	18%	19%	
Case 6	Case 6-1	12.0%	5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
	Case 6-2		8%	6%	7%	7%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%		
	Case 6-3		10%	6%	7%	7%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	
	Case 6-4		12%	6%	7%	7%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	
	Case 6-5		15%	6%	7%	8%	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	5%	
	Case 6-6		20%	6%	7%	8%	4%	4%	5%	5%	6%	6%	7%	7%	8%	9%	9%	10%	11%	11%	12%	13%	14%			

Table 5.4: Relative impact due to India in liquid bulk shipping over the previous 4 years starting from 2004 to 2025. The shaded cells represent the region that should accompany a liquid bulk shipping boom.

5.3 Impact on Dry Bulk Shipping

China previously an exporter of coal, iron ore and other minerals to Japan and Korea swiftly became deficient and had to import these. We present here an analysis similar to the one performed for the cases of POL products and containers to the case of dry bulk cargo (primarily coal, iron ore, grains).

Country/Region	Volume (1000 Tonnes)				Net Change (1000 Tonnes)	Change Relative to World Total in 2001 (%)
	2001	2002	2003	2004	(2001-2004)	(2001-2004)
China	69,367	79,815	96,509	117,910	48,543	3.9%
India	97,703	100,626	107,304	115,146	17,443	1.4%
World	1,251,000	1,299,000	1,383,000	1,490,000	239,000	19.1%

Table 5.5: Dry bulk cargo trade handled by ports in China, India and World in thousands of tonnes from 2001 to 2004 [2, 34, 25].

Table 5.5 reproduces the tonnage of dry bulk cargo trade handled by China, India and World over a period from 2001 to 2004. The data for the Chinese traffic is obtained from the annual report on China's shipping development [2], while that for India is obtained from the Indian Ports Association [34] website. The global figures were obtained from American Association of Port Authorities website [25]. One can immediately observe that in 2001 the Indian ports handled 1.4 times the dry bulk cargo handled by Chinese ports, but by the end of 2004 the Chinese ports overtook the Indian ports.

From 2001 to 2004, the volume of dry bulk cargo handled in the world increased by 19%. Of the 19% increase in global dry bulk cargo traffic, 4% was due to increased traffic in China and only 1% is attributed to India. Hence over the four year period from 2001-2004, nearly 20% of the growth in the global dry bulk cargo handling was due to China. This increase in Chinese dry bulk cargo traffic led to increased rates of shipping.

A similar impact on prices may be expected if the dry bulk cargo traffic in India over a 4 year period results in a growth similar to the 5% growth experienced by China. An analysis similar to the one performed for container shipping is performed for POL products where we wish to evaluate when this critical figure is reached in the case of India.

Depicted in Table 5.6, is the various scenarios simulated based on the assumed growth of dry bulk cargo handled in: 1) the world (2%pa to 12%pa), and 2) India (5%pa to 20%pa). For each combination of the assumed global and Indian dry bulk cargo trade handling growth rates, we first obtain the expected volumes from 2005-2025, and then find the corresponding increase in the dry bulk cargo handled in India (over a similar 4 years) relative to the dry

bulk cargo handled worldwide. This metric represents the relative impact due to India's increasing handling of dry bulk cargo and a possible indicator of another boom in the dry bulk cargo shipping.

5.3.1 Simulation Results (Dry Bulk Cargo Traffic)

From Table 5.6, one can observe that an impact similar to China is possible only for select combinations of global and Indian dry bulk cargo handling growth rates. The shaded cells represent the specific cases where the current analysis predicts a similar boom in shipping. A summary of the analysis is given below:

- The Table 5.6 clearly reproduces the current boom and expects this boom to continue until 2006 provided the rate of growth for dry bulk cargo handling in India is above 5%. This boom is expected to continue for very high dry bulk cargo handling growth rates (15% or 20%) for India.
- For Indian dry bulk cargo handling growth rates below 10%, another boom is not expected unless there is a sudden slowdown in the global growth.
- For realistic values of 5% growth rate for the world and 10-15% for India, one expects a liquid cargo shipping boom as early as 2011.

Specifically for the case of dry bulk cargo the previously existing routes of China-Japan and China-Korea were broken. China, Japan and Korea now had to import these dry bulk cargo products from far off South America and Australia. This has resulted in even higher increase in the ton-miles required by the bulk cargo ships. It is this metric of ton-miles that is the best indicator of the utilization of the fleet and the shipping price.

Case No.	Assumed Dry Bulk Handling Growth Rate		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
	World	India																							
Case 1	Case 1-1	2.0%	5%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Case 1-2		8%	9%	10%	10%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	5%	5%	5%	6%
	Case 1-3		10%	9%	10%	10%	3%	3%	3%	3%	3%	4%	4%	4%	5%	5%	5%	6%	6%	7%	7%	8%	9%	9%	10%
	Case 1-4		12%	9%	10%	10%	3%	3%	4%	4%	5%	5%	5%	6%	7%	7%	8%	9%	10%	11%	12%	13%	14%	15%	17%
	Case 1-5		15%	9%	10%	11%	4%	5%	5%	6%	7%	7%	8%	9%	11%	12%	13%	15%	17%	19%	22%	24%	27%	31%	35%
	Case 1-6		20%	9%	11%	12%	6%	7%	8%	9%	11%	13%	15%	18%	21%	24%	29%	34%	40%	47%	55%	64%	76%	89%	105%
Case 2	Case 2-1	3.5%	5%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Case 2-2		8%	10%	10%	10%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	5%	
	Case 2-3		10%	10%	11%	11%	3%	3%	3%	3%	4%	4%	4%	4%	4%	5%	5%	6%	6%	7%	7%	8%	8%	8%	8%
	Case 2-4		12%	10%	11%	11%	3%	4%	4%	4%	5%	5%	5%	6%	6%	7%	7%	8%	9%	9%	10%	11%	12%	13%	14%
	Case 2-5		15%	10%	11%	12%	4%	5%	5%	6%	7%	7%	8%	9%	10%	11%	12%	14%	15%	17%	19%	21%	23%	26%	29%
	Case 2-6		20%	10%	11%	13%	6%	7%	8%	9%	11%	13%	15%	17%	20%	23%	27%	31%	36%	42%	48%	56%	65%	75%	87%
Case 3	Case 3-1	5.0%	5%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Case 3-2		8%	10%	10%	10%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%
	Case 3-3		10%	10%	11%	11%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	5%	5%	5%	5%	5%	6%	6%	6%	6%
	Case 3-4		12%	10%	11%	11%	3%	4%	4%	4%	4%	5%	5%	5%	6%	6%	6%	7%	7%	8%	8%	9%	9%	10%	11%
	Case 3-5		15%	10%	11%	12%	4%	5%	5%	6%	6%	7%	8%	8%	9%	10%	11%	12%	13%	14%	16%	17%	19%	20%	22%
	Case 3-6		20%	10%	11%	13%	6%	7%	8%	9%	10%	12%	14%	15%	18%	20%	23%	26%	30%	34%	39%	45%	51%	59%	67%
Case 4	Case 4-1	7.5%	5%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Case 4-2		8%	10%	10%	10%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Case 4-3		10%	10%	11%	11%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%
	Case 4-4		12%	10%	11%	11%	3%	4%	4%	4%	4%	4%	5%	5%	5%	5%	5%	6%	6%	6%	6%	6%	7%	7%	7%
	Case 4-5		15%	10%	11%	12%	4%	5%	5%	5%	6%	6%	7%	7%	7%	8%	9%	9%	10%	10%	11%	12%	13%	14%	15%
	Case 4-6		20%	10%	11%	13%	6%	7%	8%	8%	9%	11%	12%	13%	15%	16%	18%	20%	23%	25%	28%	32%	35%	39%	44%
Case 5	Case 5-1	10.0%	5%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Case 5-2		8%	10%	10%	10%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Case 5-3		10%	10%	11%	11%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Case 5-4		12%	10%	11%	11%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	5%	5%	5%
	Case 5-5		15%	10%	11%	12%	4%	5%	5%	5%	5%	5%	6%	6%	6%	6%	7%	7%	8%	8%	8%	8%	9%	9%	10%
	Case 5-6		20%	10%	11%	13%	6%	7%	7%	8%	9%	9%	10%	11%	12%	13%	15%	16%	17%	19%	21%	22%	24%	27%	29%
Case 6	Case 6-1	12.0%	5%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%
	Case 6-2		8%	10%	10%	10%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
	Case 6-3		10%	10%	11%	11%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Case 6-4		12%	10%	11%	11%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Case 6-5		15%	10%	11%	12%	4%	4%	5%	5%	5%	5%	5%	5%	5%	6%	6%	6%	6%	6%	6%	6%	7%	7%	7%
	Case 6-6		20%	10%	11%	13%	6%	7%	7%	7%	8%	9%	9%	10%	11%	11%	12%	13%	14%	15%	16%	17%	18%	20%	21%

Table 5.6: Relative impact due to India in dry bulk shipping over the previous 4 years starting from 2004 to 2025. The shaded cells represent the region of impact that should accompany a dry bulk cargo shipping boom.

5.4 Concluding Remarks

Summarizing, I would not bet for another container shipping boom due to India alone. But I would recommend investments in both liquid bulk cargo and dry bulk cargo shipping. In addition, I believe that there would not be any sudden slowdown in the demand from China.

This argument is further supported by the fact that the ton-miles traveled by the global shipping industry increases nonlinearly with increase in tonnage handled. This is caused as a result of the newly established routes for liquid bulk and dry bulk cargoes being longer than the current ones. Ton-miles or TEU-miles are a much better indicator of the possible impact as it captures the occupancy of the ships over a time period as well. However limited data was available for each of the sub categories we analyzed.

In the case of container shipping, the US and South East Asian markets are farther away from India than China but the markets of EU, Middle East Asia and Africa are much closer than China. Thus the result depends on the relative growth in each of the markets for Indian merchandise.

The rationale for growth in shipping for China is the trade growth from manufactured goods and commodities and Chinese dependence on merchandise trade. However, Indian economic growth stems from growth in information trading (services, intellectual property etc.). One should be looking forward for growth in the enablers of information trading (eg: communication networks, global delivery models) [42]. It is no wonder that Indian companies are doing well in those areas of information trading as Chinese companies are doing in shipping/shipbuilding.

Chapter 6

Conclusions

6.1 Summary

Trade liberalization in an economy historically has brought forward improvements in the living standards of its people. A key enabler of global trade is ocean shipping. Both China and India have made rapid and steady progress in liberalizing trade though China has a head start of over a decade.

In the maritime sector, China currently enjoys a huge demand, vastly improved infrastructure, experience and know-how, capital, and a very favorable regulatory and political environment conducive to allow the access to its resources (primarily human resources). In the meantime India suffers from chronic under capacity issues, lack of scale, lack of know-how and suffers from a government riddled with bureaucratic inefficiency preventing access to its labor pool.

China's decade long lead in allowing international trade, has allowed it to be in a much better position than India. In Chapters 2 and 4 the issues leading to such a position are described in great detail. Here a brief summary of the key factors are presented.

1. *Demand and Relevance of Maritime Sector:* China was able to achieve a scale of operation driven by the need to export huge quantities of merchandise and import the raw materials needed to produce them.
2. *Access to Infrastructure:* China has already in place significantly better physical infrastructure due to heavy investment, enabling the above demand.
3. *Access to Labor:* Though similar in labor strength, China offers great flexibility in deploying them and allowing access to this pool.
4. *Geographic Advantage:* China is favorably located between the maritime hot spots of

Japan, South Korea, Taiwan and Hong Kong, and positioned across the Pacific Ocean to U.S. a key consumer.

5. *Dedicated Governments:* Though Chinese government is not credited for being transparent, its single minded determination is in stark contrast to the transparent, federal, multi-party democratic environment in India which lacks from political continuity, implementation and swiftness in decision making.
6. *Financial System and Tax Structure:* India has a tax structure which discourages domestic shipping industry, while China has relied on Hong Kong as a tax haven and a center of finance to attract shipping companies across the world.

Of the above 6 major issues, there is no one issue which will make India perpetually disadvantaged. In the medium and long term, the demand and relevance of maritime sector, infrastructure will all be realized in India as well. In the long-medium term again, China will be at a disadvantage in labor to India. Geographically, India can use its advantage of being present in a high growth region of Middle-East and South-East Asia and its extensive coast line.

6.1.1 The Outlook

In resource scarce countries like China and India, better infrastructure is a key enabler of growth and upfront investment can have significant impact. Looking forward China seems to embark upon a model where, the infrastructure is first developed and then awaiting an economic growth, which is primarily supply-driven. India on the other hand is experiencing a demand-driven growth. A supply driven growth requires upfront investment of an exorbitant magnitude, while a demand driven growth might initially have teething problems but is usually more sustainable.

Previously crisis driven, India has already transformed to a success driven economy. Further, India has seen a spurt in growth of investments as result of both domestic savings and FDI. The result is significant to revitalize the Indian infrastructure, manufacturing sector and domestic construction. India over the last couple of years has been making *fundamental changes* in the maritime policies, in addition to building several land based and shore based infrastructure (terminals, highways, railways). The maritime sector, will require a few years to fully observe the volumes and the capacity utilizations that will be added.

Based on the analysis performed in Chapter 5 for the specific cases of container, liquid bulk and dry bulk cargo segments, a mixed picture is predicted. Another boom in container shipping is not expected, while the chances of a boom in liquid bulk and dry bulk cargo

are much more probable. It is expected that the continued demand for commodities from China and the new demand from India would lead to another boom in liquid bulk and dry bulk cargo segments.

As mentioned before, the rationale for a growth in shipping for China is the trade growth from manufactured goods and commodities and Chinese dependence on merchandise trade. However, Indian economic growth emerges from growth in information trading (service outsourcing etc.). One should be looking forward for growth in the enablers of information trading (eg: global communication networks, computing solutions providers, global sourcing) [42]. It is no wonder that Indian companies are doing well in those areas in a way similar to the Chinese companies doing extremely well in shipping/shipbuilding.

6.2 Recommendations for Future Research

The analysis performed in this thesis uses data from a variety of sources. These sources may not have a common way of arriving at the numbers and could significantly alter the outcome of the predictions. Much better predictions are possible during the analysis if one uses the unit of ton-miles instead of the volumes handled and represents a limitation of the current method employed. This produces an opportunity for future research.

Significant changes are happening in terms of regulatory environment, commodity and energy prices. With India and China changing at such a dramatic pace, it is only natural that the data and analysis produced in the thesis will evolve with time and need corrections and improvements. A continuous updating of the thesis with the new numbers hence presents another topic of further research.

Third topic of future research would entail an analysis where one takes into account the effect of the economic growth of both China and India. It is normal practice to isolate the effects of China and India separately and obtain the net impact on global shipping. However, in this specific case, the expected impact could differ substantially if one considers the economic growth of both China and India. Thus this interdependency is also a topic for further research.

Analysis presented in Chapter 5 is limited to container, liquid and dry bulk cargoes. However, a fourth very important cargo of LNG is not considered, primarily due to the difficulty in obtaining the data. The author expects that this is one area of ocean transport which will present the best promise. A study with greater depth into this cargo category is also warranted.

Appendix A

List of Acronyms Used

Full Name	Acronym
United States	US
European Union	EU
People's Republic of China (China)	PRC
Republic of Korea (South Korea)	ROK
Twenty Equivalent Units	TEU
Dead Weight Tonnage	DWT
Gross Registered Tonnage	GRT
Million Metric Standard Cubic Meters Per Day	MMSCMD
Million Metric Tonnes Per Annum	MMPTA
Purchasing Power Parity	PPP
Gross Domestic Product	GDP
Non Performing Loans	NPL
Value Added Tax	VAT
Special Economic Zone	SEZ
Export Processing Zones	EPZ
State Owned Enterprises	SOE
Liquefied Natural Gas	LNG
Petroleum, oil, and lubricant	POL
International Monetary Fund	IMF
Foreign Direct Investment	FDI
Most Favored Nation	MFN
China State Shipbuilding Corporation	CSSC
China Shipbuilding Industry Corporation	CSIC
China State Shipbuilding Corporation	CSSC
China Ocean Shipping Company	COSCO
Shipping Corporation of India	SCI

Table A.1: List of acronyms used in the thesis.

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