Annex VI - Case Study - China

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VI.1 General Description and Basic Economy

The Peoples' Republic of China (PRC) has a diverse geography that stretches over 9.6 million square kilometres of land. It is the most populous country in the world with over 1.3 billion people but the population is aging rapidly. China is the world's second largest economy by nominal GDP after the United States but GDP per capita was estimated to be 8500 USD ranking 122nd in 2011 lagging behind Timor-Leste and Ecuador. GDP composition by sector is highest in industry (46.8%) followed closely by services (43.1%), with agriculture making up the rest (10.1%)1. Exports revenue totalled an estimated $1.9 trillion (current USD) in 2011, greater than the imports estimate (current USD 1.7 trillion)2 giving China a trade surplus of around USD 0.2 trillion. China is considered one of the world's fastest-growing economies, with annual growth rates averaging 10% over the past 30 years (see Figure 1). China was also the largest exporter in 2010 following the economic expansion that started in the 1970s. Although it has the highest number of bordering countries by land, most trade and economic activities take place through shipping and aviation, meaning these sectors are crucial to the economy.

[1] www.cia.gov/
[2] http://www.mitc.com/trade/AerospaceIndustryReportChina.pdf.pdf

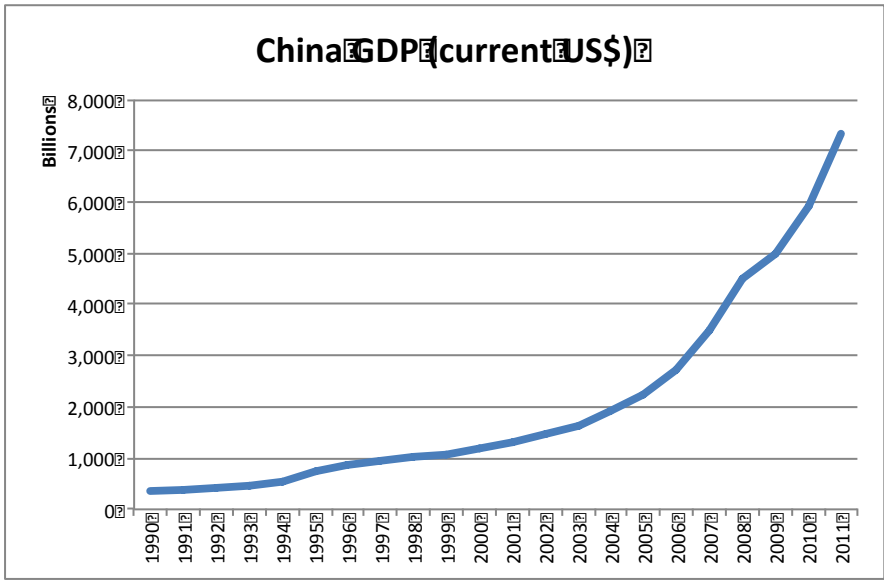

Figure 1 GDP of China, 1990-2011. Source: World Development Indicators

The PRC is a single-party state governed by the Communist Party of China. It exercises jurisdiction over 22 provinces, five autonomous regions, four directly controlled municipalities (Beijing, Tianjin, Shanghai, and Chongqing), and two mostly self-governing special administrative regions (Hong Kong and Macau). China is projected to become the largest economy in the next five years by leading economists[3].

VI.2 Nature of Aviation and shipping Industries

VI.2.1 Aviation

China is home to over 190 civil airports,[4] of which 42 receive international cargo and passenger flights.[5] Further, 34 airlines are registered in China.[6] Because of a fast growing economy with a strong export focus and an expanding tourism sector both domestically and internationally, the aviation and service industries in China have experienced rapid development since early 1990s when China's economic reforms opened up trade. The number of national airports are an indicator of this; 92 airports existed in 1992, and as of July 2012, 182 airports are fully operational (see Table 1).[7] According to the Civil Aviation Administration of China, the 12th Five Year Plan (2011-2015) contained plans to construct 82 new airports and expand a further 101 existing airports.[8] Despite this rapid development, however, China's airport

[3] Johnathan Fenby, C. Kwan, Nomura Securities; http://www.telegraph.co.uk/finance/9237790/China-will-overtake-the-US-to-become-the-worlds-largest-economy-in-five-years.html#
[4] http://www.forbes.com/sites/gordonchang/2012/07/22/will-china-build-82-unneeded-airports-by-2015-you-betcha/
[5] http://www.eai.nus.edu.sg/BB526.pdf
[6] http://www.airlineupdate.com/content_public/airlines/far_east/china.htm.
[7] http://finance.people.com.cn/n/2012/0725/c1004-18596764.html
[8] Ibid.

density with regard to population or land area size is still well below the level of the advanced countries[9].

With the deregulation of airport construction, private investors have boosted the recent growth in Chinese airports and the related industry.[10] The central and local governments are heavily investing in this industry as basic infrastructure to boost local economy in the current economic slowdown. The three biggest airlines in China are also the biggest airlines in Asia – China Southern Airlines with a fleet of 468 active aircrafts,[11] China Eastern Airlines with 302 active aircrafts, and Air China Ltd which has a fleet of 286 active aircrafts.[12] Both Table 1 and Figure 2 show the volume of freight and passenger from 1990 to 2008, a period of significant growth in China's aviation sector. Since the financial upheavals from 2009, the growth rate of air freight has fallen. 2011 saw a 16% dip on international air cargo routes due to the Japanese earthquake.[13]

Table 1: Selected Indices of Mainland China's Civil Air Transportation, 1980-2005. Source: Wang & Jin, 2007[14]

Indicator	1980	1985	1990	1995	2000	2005
Number of airports	77	80	92	116	139	142
Passenger traffic, mill. persons	3.4	7.5	16.6	51.2	67.2	138.3
Passenger traffic turnover, mill. person-km	39.6	116.7	230.5	681.3	970.5	2044.9
Freight traffic, thous. tons	90	200	370	1010	1970	3070
Freight traffic turnover, mill. ton-km	140.6	415.1	818.2	2229.8	5026.8	7889.5

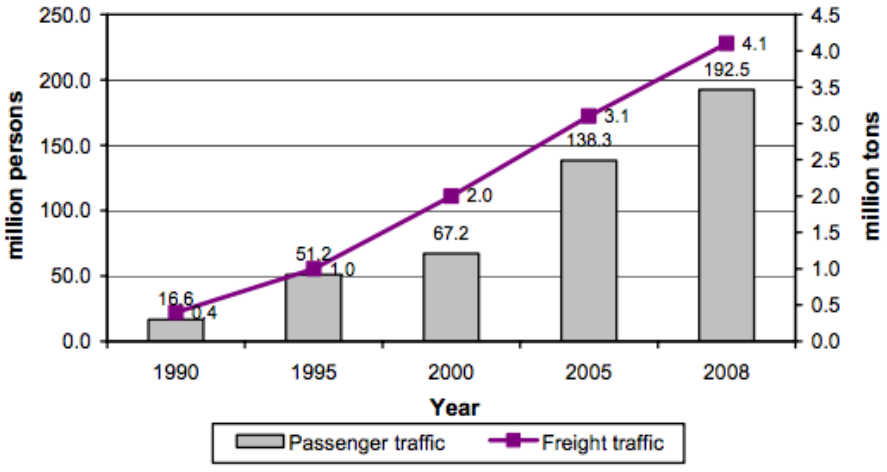

Figure 2 Freight and Passenger Volume 1990 – 2008. Source: Yang & Yu, 2010[15]

[9] http://www.pwc.com/in/en/assets/pdfs/industries/general-aviation-070312.pdf

[10] http://export.gov/china/build/groups/public/@eg_cn/documents/webcontent/eg_cn_047964.pdf

[11] For more information regarding specific models please see http://www.csair.com/en/about/report/2012/eng_20120831_1.pdf

[12] For more information regarding specific models please see http://www.planespotters.net/Airline/Air-China

[13] http://www.china.org.cn/business/2011-06/23/content_22843360.htm

[14] http://www.igsnrr.cas.cn/xwzx/jxlwtj/200801/W020090715581058329288.pdf

Major air routes for China's international aviation overlap with shipping routes;[16] for distance to key market see the next section.

VI.2.2 Shipping

90% of China's foreign trade is transported by sea.[17] China's coastal ports enable the transportation of coal, containers, imported iron ore, and grain. 130 of China's 2000 ports are open to foreign ships. In 2008, 6 out of the 10 largest ports in the world (by container traffic) were located in China,[18] with Shanghai recorded as the world's busiest container port followed by Hong Kong, Shenzhen, Ningbo, Guangzhou and Qingdao. Eight Chinese ports were on the list of the twenty largest container ports.[19]

World container port throughput increased by an estimated 13.3% to 531.4 million TEUs[20] in 2010 after a decrease in 2009. Chinese mainland ports continued to increase their share of total world container port throughput to 24.2%[21]. China and South Korea between them built 72.4% of world ship capacity (dwt) in 2010[22]. The three major shipbuilding nations are China, Korea and Japan, where 90% of ships (in terms of world tonnage) is built.

According to the UNCTAD 2011 annual Review of Maritime Transport, the Liner Shipping Connectivity Index (LSCI) reveals that China continues its lead as the single most connected country[23], followed by Hong Kong SAR, Singapore and Germany[24]. Table 2 shows a list of the top 10 ports in China according to capacity ranking. The first 6 ports are huge on the international standards as they are also amongst the biggest ports abovementioned in the world container traffic ranking. Figure 3 indicates, however, that international maritime transport took up only 11% of GHG emissions from China in 2007. As Figure 4 demonstrates, domestic shipping has grown more than foreign trade shipping from 1999 – 2009.

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[15] http://www.eai.nus.edu.sg/BB526.pdf

[16] PwC Transportation & Logistics 2011 Report http://kc3.pwc.es/local/es/kc3/publicaciones.nsf/V1/D1DDB8E8E57CD617C125786200351710/$FILE/Future%20of%20world%20trade-%20FINAL%20160311.pdf

[17] http://www.unece.org/fileadmin/DAM/trans/doc/2008/wp5/GE1_Piraeus_Opening_Xu.pdf

[18] http://aapa.files.cms-plus.com/Statistics/WORLD%20PORT%20RANKINGS%2020081.pdf

[19] http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports

[20] Twenty-Foot Equivalent Units

[21] http://unctad.org/en/Docs/rmt2011_en.pdf

[22] Ibid

[23] the index captures how well countries are connected to global shipping networks. It is computed by the United Nations Conference on Trade and Development (UNCTAD) based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. For each component a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004. . The underlying data come from Containerisation International Online.

[24] http://unctad.org/en/Docs/rmt2011_en.pdf

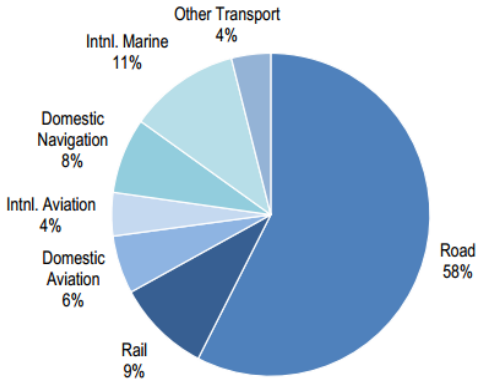

Figure 3: China's Transport GHGs Emissions 2007
Source: Internationaltransportforum.org

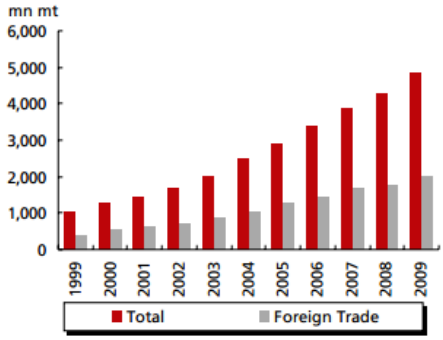

Figure 4: China Coastal Freight Throughput Growth 1999 - 2009
Source: Dbsvresearch.com

China's top three shipping companies are the China Ocean Shipping Company "COSCO" (State-owned enterprise), China Shipping Container Lines "CSCL" (State-owned enterprise), Sinotrans (HK) Shipping "Sinotrans" (State-owned enterprise).

COSCO operates more than 130 container ships including the 10000TEU carriers with a total capacity of over 300,000 TEUs and has achieved an annual shipping volume of 4 million TEUs. COSCO's liner business maintains the leading position in China and one of the top 10 in the world. At present, COSCO operates more than 20 major liner routes calling more than 100 ports worldwide. COSCO owns and operates the largest dry bulk fleet in the world with a total capacity of 28 million dwt. COSCO also owns and operates the largest liquid bulk fleet in China of more than 30 vessels including the crude oil tanker, product tanker, LNG and the chemical carriers. COSCO operates over 110 general cargo and specialized vessels with a total capacity of 1.8 million dwt[25].

As of September 2012, CSCL has a fleet of over 150 vessels with a total operating capacity of 600000TEU, ranking among the world's top 10 liner companies.[26]

As of the end of 2011, Sinotrans Shipping owns a fleet of 51 vessels with an aggregate capacity of 3.2 million DWT and an average age of approximately 9.3 years. The Group's fleet comprised 40 dry bulk vessels with an aggregate capacity of approximately 2.79 million DWT,1 oil tanker with capacity of approximately 310,000

[25] cosco.com
[26] http://www.cscl.com.cn/english/vessel7.asp

DWT, and 10 container vessels with an aggregate capacity of 6,667 TEU. Dry bulk shipping is the core business of our Group. We owned a fleet of 40 dry bulk vessels, including 2 multi-purpose vessels, 11 Handy size dry bulk vessels, 8 Handy max dry bulk vessels, 13 Panamax dry bulk vessels and 6 Capesize dry bulk vessels for transportation of dry bulk cargoes such as iron ore, coal, grain, steel and other commodities along major trading routes in the world.[27]

China's major trading partners are US, Japan, South Korea and Germany in order of volume[28]. Distance to key markets for China's shipping industry is approximately summarised as the following:

- Shanghai – Los Angeles 5724 nautical miles;
- Shanghai – Tokyo 1028 nautical miles;
- Shanghai – Busan 456 nautical miles;
- Shanghai – Hamburg 10657 nautical miles.

According to the same report by PwC, India will emerge as China's major air and sea freight destination in the next decade, the distance from Shanghai – Jawaharlal is 4572 nautical miles.

Table 2: China's top 10 ports (excluding Hong Kong) by port capacity ranking in 2011[29]

Source: translated from information on http://wenku.baidu.com/view/606ccafd941ea76e58fa049f.html

	Port	Capacity 100 mil ton	Description
1	Zhoushan Ningbo	6.91	Includes several islands and shores; main port for ores, crude oil, coal and other natural resources import for land transportation transfer, main hub for international routes
2	Shanghai	6.2	Main port for manufactured export, key commercial international routes hub
3	Tianjin	4.51	Key merchandise port with over 260km^2 land and water area, can host up to 300,000 tonnes ship type, max harbour depth 20m, 21.5km shore length, under expansion
4	Guangzhou	4.29	Together with neighbouring Hong Kong and Shenzhen, the trio ports in Canton region support a robust out-looking economic zone
5	Suzhou	3.8	Biggest non-coastal port
6	Qingdao	3.75	Important international port in northern China, well facilitated with rail and road infra
7	Dalian	3.38	Key non-freezing port in the north, hub of north Asian economic zone
8	Tangshan	3.08	Specialises in equipment
9	Qinhuangdao	2.87	Key all year non-freeze port for domestic coal transport
10	Yinkou	2.61	Mainly grain, cars, fertiliser

[27] SINOTRANS SHIPPING LIMITED Annual Report 2011
[28] PwC Projections 2011
http://kc3.pwc.es/local/es/kc3/publicaciones.nsf/V1/D1DDB8E8E57CD617C125786200351710/$FILE/Future%20of%20world%20trade-%20FINAL%20160311.pdf
[29] http://wenku.baidu.com/view/606ccafd941ea76e58fa049f.html

VI.3 Export and Import Summary

VI.3.1 Exports

According to the World Bank statistics, trade to GDP ratio of China is 53.2% (2011 data). China's top trading partners are shown in Table 3 below.

Table 3: China's Top Trading Partners in 2011. Source: National Statistic Bureau[30]

Unit: 100 million USD

Country or region	Exports	Increase over 2010 (%)	Imports	Increase over 2010 (%)
European Union	3560	14.4	2112	25.4
United States	3245	14.5	1222	19.6
Hong Kong, China	2680	22.8	155	26.4
ASEAN	1701	23.1	1928	24.6
Japan	1483	22.5	1946	10.1
Republic of Korea	829	20.6	1627	17.6
India	505	23.5	234	12.1
Russia	389	31.4	403	55.6
Taiwan, China	351	18.3	1249	7.9

The largest exports partners for China are the United States, European Union, Japan, Hong Kong and South Korea. China exports in May 2011 were worth 157 Billion USD (current). However, amid a global economic slowdown, demand from these markets have seen reductions and as a result China is seeking to expand its domestic consumption. The government has announced plans to redirect investment into domestic consumption in order to compensate the weakening demand for exports from the Western economies and re-balance the nation's economic structure. However this is not anticipated to take immediate effect and export will still be the backbone of the economy in the next few years despite growing import reliance.[31] Figure 5 shows China's import and export patterns from 1997, with Figure 6 breaking down exports into commodities. According to DBS & Vickers Securities, exports drives containerised cargo throughput; in the mean time import drives non-containerised cargo throughput – mainly raw materials due to high demand in infrastructure construction, high end equipment and consumer products.

[30] http://www.stats.gov.cn/english/newsandcomingevents/t20120222_402786587.htm

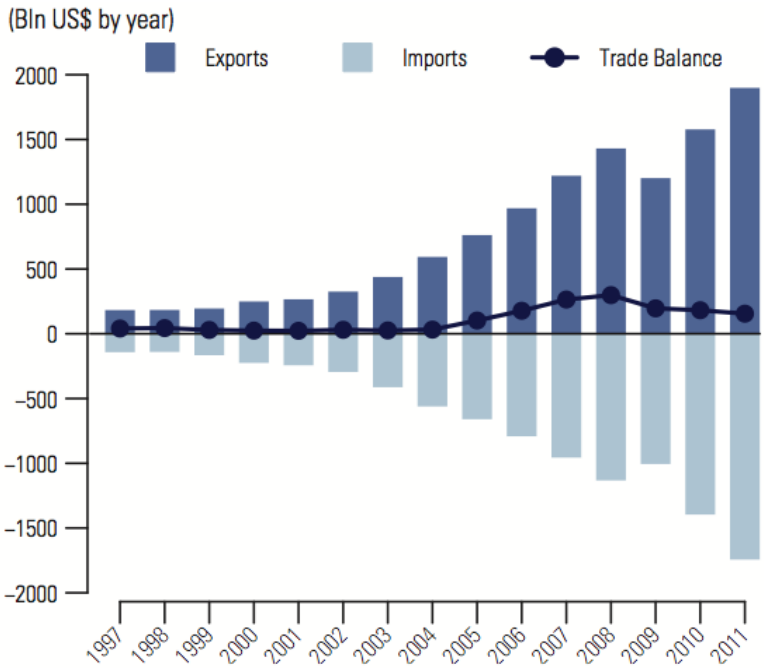

Figure 5: China's Annual Export & Import 1997 – 2011
Source: UN COMTRADE

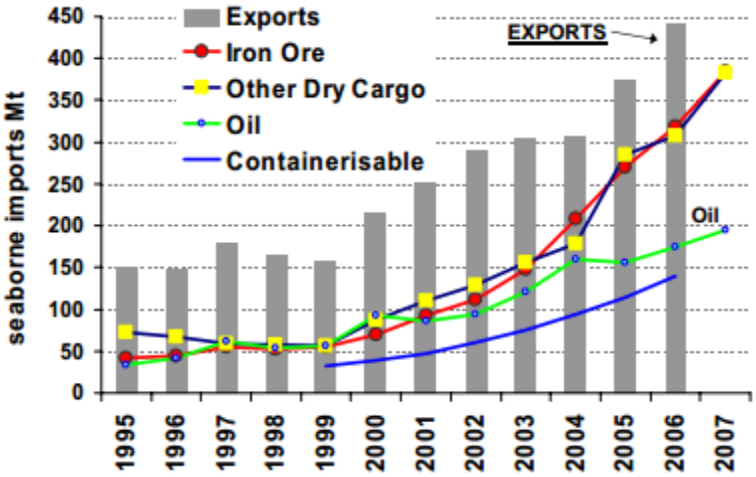

Figure 6: Chinese seaborne exports & imports 1995-2007
Source: Stopford et al, 2007[32]

VI.3.2 Imports

In May 2011, China imported products and services worth 144 Billion USD. China's main imports include commodities such as oil & minerals, iron & steel, machinery & equipment, medical & optical equipment, plastics and organic chemicals. China imports mainly from the European Union, Japan, Taiwan, South Korea and ASEAN countries. In 2011, China was the second biggest trading partner to the EU after US - EU goods exports to China 2011: €136.2 billion (+20% on 2010) EU goods imports

32 http://www.clarksons.net/archive/research/freestuff/China%20Maritime%20The%20Next%20Phase%20Nov%2007%20(final).pdf

from China 2011: €292.5 billion (+3% on 2010); China was also the second biggest trading partner of US – US export to China stood at $103.9 billion (+13% from 2010, €79.1 billion equivalent[33]), US import from China amounted to $399.3 billion (+9.4% from 2010, €304.3 billion equivalent[34]). It is important to note that China has become a key part of the global production chain, with most imports manufactured and re-exported, resulting in the huge volume of transport.

Table 4: Shares of commodities as a % of merchandise export and import 1995 – 2011

Year	Export					Import				
	Agricultural raw materials	Food	Fuel	Manufactures	Ores & Metals	Agricultural raw materials	Food	Fuel	Manufactures	Ores & Metals
1995	2	8	4	84	2	5	7	4	79	4
1996	2	8	4	84	2	5	6	5	79	4
1997	1	7	4	85	2	5	5	7	77	5
1998	1	7	3	87	2	4	5	5	81	5
1999	1	6	2	88	2	4	4	5	80	5
2000	1	5	3	88	2	5	4	9	75	6
2001	1	5	3	89	2	5	4	7	78	6
2002	1	5	3	90	2	4	4	7	80	5
2003	1	4	3	91	2	4	4	7	79	5
2004	1	4	2	91	2	4	4	9	75	7
2005	1	3	2	92	2	4	4	11	73	9
2006	0	3	2	92	2	4	3	12	71	9
2007	0	3	2	93	2	4	4	12	68	12
2008	0	3	2	93	2	4	5	16	62	13
2009	0	3	2	94	1	3	5	13	64	14
2010	0	3	2	94	1	4	5	15	61	14
2011	..	..	..	93	..	..	..	..	..	..

Source: Data bank, World Bank

VI.3.3 Tourism

As Figure 7 shows, although numbers of international tourists have been increasing over the last two decades, the percentage of total exports made up by receipts from international tourism has been decreasing, dropping from a peak of 6.8% in 1999 to under 3% in 2010. This is most likely due to the rapid expansion of China's export economy.

[33] 1 USD = 0.761728 EUR, www.oecd-ilibrary.org/economics/country-statistical-profile-china_csp-chn-table-en

[34] Ibid.

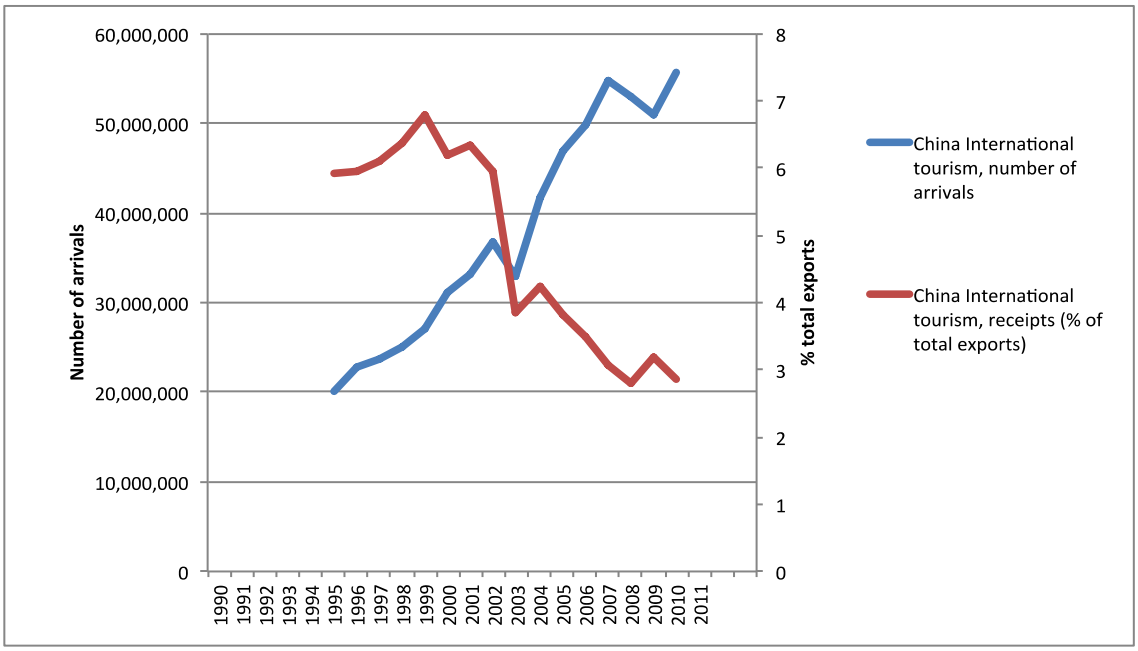

Figure 7. International tourism – arrivals and receipts as % of total exports, 1990-2011. Data from World Development Indicators.

VI. 4. Key Demographics

China is the most populous country in the world with 1,343,239,923 persons by July 2012.[35] Since the economic reforms from 70s, China has opened up its economy and witnessed improved living standard and socio-economic situation as shown in the expansion of GDP per capita which stood at $8,500 in 2011, $7,800 in 2010 and $7,100 in 2009.[36] GINI coefficient figures over the period showed mixed performance, as shown in Table 4 below.

Table 4: Income distribution in China 1996 – 2005.

	1996	1999	2002	2005
Income share held by fourth 20%	22	22	22	22
Income share held by highest 10%	28	30	32	32
Income share held by highest 20%	43	46	49	48
Income share held by lowest 10%	3	3	2	2
Income share held by lowest 20%	7	6	5	5
Income share held by second 20%	11	10	9	10
Income share held by third 20%	16	15	14	15
GINI index	36	39	43	42

[35] https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html
[36] Ibid

Source: World Bank[37]

China's export-led economy is dependent upon an extensive, largely unskilled labour force.[38] In 2011, 26% of the total export value relied upon unskilled or low skilled workers, compared to just 3% for China's imports. According to the same source, low and medium technology-intensive products have a share in China's imports at 18% and in export at only 12%. The low-skilled and unskilled workers with lower income will be adversely affected by external market conditions. The population living below official poverty line according to the CIA has surged in 2012 as shown in Table 5 below. However, the sharp rise in numbers living under the poverty line is at least partially due to the raising of poverty standards in 2011 to $1 per person a day.[39] Conversely, the overall rising poverty rate shown by the data in Table 5 along with the rising GINI index indicate an increasing income gap during the recent growth period, with the global economic slowdown exacerbating this.

Table 5: Percentage of population below official poverty line in selected years.

Year	1999	2001	2004	2008	2009	2010	2011	2012
%	10	10	10	8	8	2.8	2.8	13.4

Source: CIA World Factbook

China used to receive and still receives some aid for poverty alleviation, but most aid programmes now in China focuses less directly on poverty and more on capacity building, education and health. In recent years however, the government has started to direct investments in supportive aid to Africa.

VI.5. Impacts on Trade and Tourism

Given the decreasing fraction of national GDP sourced from tourism, reduced tourism may have less impact on the national economy than it would have ten or more years ago. However, given the high trade intensity of China's GDP, with exports making up 27% of national GDP and China's recent growth partially a result of an ability to produce a large volume of exports at low cost, increased costs of shipping and aviation could have significant consequences for China. Yet the government's plans to reduce dependence upon exports, as discussed above, could buffer this.

VI.6. Plans Port Expansions

The government has announced, in the 12th five-year plan for 2011-2015, aims to boost transportation and infrastructure building to facilitate the economic transition from export to consumption[40]. Airport construction is expected to receive 1.5 trillion RMB[41] in the national plan, increasing the number of airports from 175 to 220 and

[37] http://www.econ.ucdavis.edu/faculty/woo/9.Wang-Woo.Hidden%20Income%20in%20China.2010-12-25.pdf

[38] www.ncaer.org/downloads/MediaClips/Press/GNatraj&AnjaliTandonChina%20ChangingStructure.pdf

[39] http://www.chinadaily.com.cn/china/2012-06/25/content_15522162.htm

[40] http://www.cbbc.org/guide/chinese_regional_cities/airports_and_aviation_sector_profile

[41] Chinese Yuan Renminbi

expanding aircraft fleet from 2600 to over 4500. The Shipping industry will receive less financial attention; it is expected that most of the shipping industry expansion will be focussed on connecting domestic waterways with fewer plans to develop international shipping.

VI.7. Modelling results

Results from the Global Emissions Trading for international aviation and shipping (MBM1a) scenario predict a small (-0.009%) contraction in China's GDP in 2025, with aviation and shipping contributing -0.005% and -0.004% respectively. The magnitude of wealth tied up in China's economy, the size of its trade surplus and of its exports may explain the limited relative impact of MBMs on Chinese GDP. A declining contribution of tourism to national GDP may contribute to buffering impacts of increased aviation prices. However, given the high levels of poverty within the country, increased import costs may have significant impacts on the livelihoods of a large number of people.

When revenue recycling is considered, the overall impact of MBMs on Chinese GDP is more than halved, at a total of -0.004%, with impacts on shipping reduced to -0.001%. China currently hosts about 50% of world's CDM projects. If this trend will continue and 50% of offsets demanded by international aviation and shipping will be provided by China in 2025 then this is likely to compensate for the losses from MBMs for international aviation and shipping and result in 0.035% increase of Chinese GDP.

VI.8. Similar Countries

Whilst China is one of the world's major economies with the second largest GDP, and has been growing at double-digit rates since 2000, its GDP per capita is comparable to that of Algeria and Maldives. China's investment in aviation and shipping is one of the biggest in the world, and in terms of export value it is far above any other country in the world. Only the USA and Germany come close in terms of real export value (current USD), with Japan following close behind, yet these countries are at stages of development far above that of China. In terms of HDI, China is ranked alongside Samoa, Fiji and Turkmenistan, countries with similar GDP per capita but total GDP up to 1000 times smaller than that of China and ranking 97th and lower in export value. China is often compared to other emerging economies such as India and Brazil, ranking 17th and 19th in the export value in the list that China tops, and have a trade intensity significantly lower than that of China.