
China's Pulp and Paper Industry: A Review*

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We would like to thank Xian Fu, Renyu Li, Li Liang, Zhiyong Liu, Yang Peng, Valentin Todorov, Zhimin Xin, Luping Yang for assistance on data and company visit.

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Abstract

In this report, we provide an overview of the pulp and paper industry in China, based on both industry level data and firm level data. We discussed the industry on its current stand, pattern and trends, relative importance in the world, and its transformation. More specifically, in addition to the general discussion of the pulp, paper, and paperboard sector, we also analyzed structural change on the demand during the course of economic transition, capacity expansion and foreign direct investment, company performance, and discrepancy of data from different sources. Finally, we introduced two representative companies visited in China for this study.

Key Words: Chinese pulp industry, Chinese paper industry

1. Introduction

The development of the China's pulp and paper industry is drawing increasing interest among scholars, policy makers, and international producers. Chinese paper and paperboard production ranked No.2 in the world, and reached 49.50 million metric tons in 2004 and increased to 56 million in 2005. In 2005, Chinese consumption of paper and paperboard reached 59.3 million metric tons. Chinese pulp production, which attained 14.18 million metric tons (Mts) in 2004, was also one of the top 3 producers in the world since 1995.

However, as to the per capita consumption of paper and paperboard, China has been ranked very low in the world, ranging from 57 to 68 in the world. In 2005, Chinese consumption was only 45 kg per capita, which was very low compared 300 kg per capita in countries such as the United States and Japan.¹ Therefore, The Chinese market has a great potential for paper and paperboard products.

The pulp and paper industry is one of the very few industries in China that has been experiencing shortages in supply. The domestic production cannot satisfy the domestic consumption, especially for high quality paper and paperboard products, due to old production technique and lack of high-quality raw materials.² Therefore, unlike other Chinese products, China has been importing more pulp and paper product than exporting.

Other distinguishing characteristics of the Chinese pulp and paper industry include limited wood resources, rapid expansion of capacity, direct investment from foreign producers, co-existence of large modern mills vs. a large number of out-of-dated small mills, and a large portion of state-ownership. Moreover, the advantage of low cost of labor for this industry in China is not significant. Those features raise many interesting questions for researchers and policy makers.

In this report, we review the pulp and paper industry in China. The goal is to provide a picture of this industry about its current stands, relative importance in the world, and its transformation and trends, using both industry level data and firm level data. In

¹ Data is available at China's Foreign Investment Web: <http://www.chinafiw.com>

² Although recently the Chinese domestic production overran the demand on some grades of paper and paperboard, generally the situation went the other way round on most of grades of paper and paperboard in the Chinese market.

Section 2, we discuss the pulp sector, and then the paper and paperboard sector in Section 3. Section 4 analyzes the structural change on demand during the course of economic transition. We discuss capacity expansion and foreign direct investment in Section 5. Using company level data, we will study company performance in Section 6. Given the existence of discrepancy of data from different sources, we briefly discuss this issue in Section 7. In Section 8, we introduce two representative companies visited in China for this study. Section 9 concludes.

2. Chinese Pulp Industry

The pulp industry is one of the very few industries in China that has been experiencing shortages. Domestic pulp production increased at an average annual rate of 2.5% during 1991-2005.³ However, in the same period, pulp consumption grew at a much faster pace, an average yearly rate of 4.5%.⁴ The domestic pulp production cannot meet the demand and the gap has widened, as shown in [Graph 1](#). In 2005, the domestic pulp production was 16.21 million Mts, while the consumption was 24.10 million Mts, a much bigger gap than that of 1.19 million Mts in 1991. The gap for some pulp grades is even larger. For example, for chemical wood pulp, which has become increasingly popular in China, the gap has soared since 1995 ([Graph 2](#)).

The lack of forest resources is the main reason for the shortage of high quality pulp. Although the total stock volume of forest increased from 11.78 billion cubic meters in 1994 to 12.46 billion cubic meters in 2003 in China, and in the same period, the forest coverage rate grew from 13.92% to 18.21%, the forest coverage is still very low, about 61% of the world average and ranked 130th in the world. Per capita forest stock volume is 9.421 cubic meters, only one sixth of the world average and ranked the 122nd in the world.⁵

Despite the efforts of expanding fast-growing plantations, the shortage of supply of wood for pulp production has shaped the pulp/paper industry in China. In particular,

³ For the pulp categories, the following common divisions are used: mechanical pulp (produced by a mechanical process), chemical pulp (produced by a chemical process), semi-chemical pulp (made by a chemical process followed by a mechanical process), and other pulp (for example, recycled pulp).

⁴ The growth rates are calculated from the raw data provided by Chinese Statistical Book 2003.

⁵ Data is available at XINHUANET: www.XINHUANET.com

wood pulp is only a small portion of the total pulp used in paper making, less than one fourth. Recycled pulp and other fiber pulp accounted for more than three fourths of the total pulp. The extensive use of non-wood pulp indicates that a large portion of domestically made paper and paperboard is in low quality.

Traditionally, China used a large proportion of non-wood pulp made from reed, grass and straw. The ratio of domestic wood pulp usage was only 6.7%, while non-wood pulp accounted for about one third of the pulp used in 2001 ([Table 1](#)). Grass and straw pulp accounted for 24.2% of all pulp used, about four times the amount of domestic wood pulp. However, the usage of non-wood pulp has been declining. As shown in [Graph 3](#), the total amount of non-wood pulp dropped significantly in 1996 after increasing for more than 30 years.

[Table 2](#) shows the proportion and trend of different types of pulp used in China. Chinese pulp consumption grew to 52 million Mts in 2005. Although the consumption of wood pulp increased from 5.35 million Mts in 2000 to 11.44 million Mts in 2005, it only accounted for 22% of the total pulp consumption. As can be seen, the proportion of wood pulp has been quite stable, up to 19-22%. The proportion of other fiber pulp has dropped quickly, from 40% in 2000 to 24% in 2005. In the same period, however, the proportion of recycled pulp increased significantly, from 41% in 2000 to 54% in 2005. The declining usage of non-wood fiber pulp shows a structure improvement in Chinese paper production.

In order to meet the increasing demand and to make up the gap in domestic pulp production, China relies on the international market for pulp supply. China imports from international markets for pulp supply mainly through buying wood chips, wood pulp and recovered paper.

For woodchip, before 2002, China imported a very small amount but exported much more (see [Graph 4](#)). However, since 2002, the import of wood chips increased very quickly. The import of woodchip in 2003 was about four times of the amount in 2002. The total import was about 902,000 Mts in 2005, about tripled compared to 2003.⁶ In the same period, the export of woodchip dropped quickly. The total export in 2005 is

⁶ Chinese pulp industry is importing more and more wood and has helped wood imports become the 3rd in the Chinese import list, after petroleum and steel.

less than half of that in 2000. Most imports of wood chips came from Vietnam and Austria, accounting for approximately 76% of China's total imports of woodchip. In 2005, the import from Vietnam was 405,000 Mts and from Austria was 277,000 Mts.

In China, almost all pulp imported is wood pulp. Similar to that of woodchip, the import of wood pulp also increases very fast, and at a much larger scale. As can be seen in [Graph 5](#), from 2000 to 2005, the import of wood pulp increased from 3.3 million Mts to 7.5 million Mts, almost doubled. Almost all pulp imported is wood pulp with very little import of other fiber pulp. The average growth rate of import of wood pulp from 2000 to 2005 is 19%, while the domestically produced wood pulp increased at a much lower annual rate, approximately 1.9%. Some categories of imported pulp increased even faster ([Table 3](#)). As can be seen, a majority of imported pulp is bleached chemical wood pulp.

The imported wood pulp is the major source of wood pulp used in China. Since 2000, the percentage of imported wood pulp in the total wood pulp has been rising steadily, from 62% to 74% in 2004, and 66% in 2005.⁷ China relies heavily on the international market for wood pulp and its domestically produced wood pulp only accounts for one third or less of all wood pulp used.

[Graph 6](#) shows the world market share of Chinese import and consumption of chemical wood pulp. It is clear that both shares have increased since early 1980s and the speed has accelerated after 1994, especially the share of import. Since early 1980s, when economic reform started, the share of import has been more than doubled the share of consumption in every year. By 2005, China's consumption of wood pulp was less than 7% of world total, but its imports accounted for about 18% of the world total import.

The export of wood pulp from China is almost negligible relative to the import, although in 2005 export showed a big jump, rising from 17,500,000 Mts in 2004 to 47,000 Mts (see [Table 3](#)).

Major source countries of wood pulp for China's imports include Canada, Indonesia, Russia, Chile, and the USA. They have been the principal countries exporting the wood pulp to China. In 2005 about 77% of the imported wood pulp was provided by

⁷ One reason for the drop of the number in 2005 is that the APP Hainan pulp facility, which has the capacity of 1.0 million Mts, started production in 2004.

those countries). The imports from the United States and Canada increased very fast. For example, the imported wood pulp from the US in 2005 is 2.4 times of amount imported in 2000 ([Table 4](#)).

Recycled pulp makes another major part of import of pulp sources in China. As showing in [Table 2](#), recycled pulp usage reached 28.08 million Mts in 2005. There is an increasing trend of recycled pulp usage in Chinese paper production. Since 2004, recycled pulp has accounted for more than half of the pulp used in paper/board production. In 2005, recycled pulp accounted for 54% of all pulp used. China imported a very large amount of waste paper to make recycled pulp. As shown in [Graph 7](#), the import of waste paper grew from 3.71 million Mts in 2000 to 17.03 million Mts in 2005, increasing at an average yearly rate of 35.6%, much faster than the growth of imported wood pulp. The fast growth of import is caused by increased paper/board production. Moreover, a large portion of domestically produced linear board, which is used as the wrappage and package, goes with the export goods to other countries, and thus China needs to buy it back.

Most waste paper is imported from developed countries, such as the United States, Japan, Netherland, and the United Kingdom, etc. (see [Table 5](#)), and the total imports from those four countries accounted for 78% of total import of waste paper in 2005. In 2005, US alone accounted for 44% of all waste paper imported to China. Other countries, especially Japan, are catching up quickly. From 2003 to 2005, the import of waste paper from Japan, Netherland and UK all grew at a dramatic speed, more than 100% per year.

At the beginning of 2006, the price of mixed waste paper imported from the USA reached USD \$123 per Mts. And the prices of waste linear board and #8 waste paper increased to \$133 per Mt and \$142 per Mt, respectively. It is believed that the rising trend in the price of waste paper in the world market after 1997 was mainly due to the sharp increase in demand from China.

3. Chinese Paper and Paperboard Industry

In 1949, when the People's Republic of China was founded, the total annual production of paper and paperboard was merely 0.1 million Mts. In 1979, when the

economic reform started, the total production was 6.32 million Mts. By 2005, the annual production increased to 56 million Mts. As can be seen in [Graph 8](#), since 1978, the Chinese paper industry has experienced a dramatic expansion. The production of paper and paper board has grown at a very fast rate.⁸ In terms of world share, the total production of paper and paperboard has increased from less than 4% in 1978 and to almost 15% in 2005 ([Graph 9](#)).⁹ The share of total consumption in China increased even faster and was close to 17% in 2005 ([Graph 10](#)).

Despite the rapid expansion, the shortage of paper and paperboard product has also started to grow since 1978. The gap between the domestic production and consumption became wider, especially after 1995. More specifically, in 1995, the shortage was 2.50 million Mts, and the number reached 6.39 million Mts in 1999 at its peak. Since then, the amount of shortage has shown a declining trend due to the increased capacity in China; and in 2005, the shortage became 3.30 million Mts. [Table 6](#) shows the production and total demand for the paper and paperboard products from 1990 to 2005.

Because of the shortage, China imports a large amount of paper and paperboard products from the international markets. For example, in 2001, China spent more than 6 billions dollars in importing paper and paperboard. As shown in [Graph 11](#), in the peak time of 1997, China accounted for more than 12% of the total world import of paper and paperboard. However, the share of import has been declining since then, and became less than 9% in 2005. Given the rapid increase in demand, China's reliance on international market for importing paper and paperboard products will continue in the near future.

The share of Chinese export of paper and paperboard is much smaller in the world. It was almost negligible before 1990s. Since 1992, the share has been quite stable, around 4%, as shown in [Graph 12](#). Most of the export was wrapping and package paper

⁸ According to the FAO definition, the products in paper and paperboard industry are divided into four main categories: newsprint, other printing & writing paper, wrapage & package paper and board, and household & sanitary paper.

⁹ The Chinese world market share of production was calculated as: Chinese production/world total production; by the same token, Chinese market share of import was calculated by: Chinese import/world total import; Chinese market share of export was calculated by: Chinese export/world total export; Chinese market share of consumption was calculated by: Chinese consumption/world total production.

and board.¹⁰ As shown in [Graph 13](#), the amount of export has been increasing steadily since 2000, although the magnitude is still much smaller relative to imports.

[Table 7](#) shows the top 5 counties/areas that China imported paper and paperboard products. Among counties, the United States was listed at the first spot in 2005, surpassing South Korea. [Table 8](#) shows the amount of imports from 2000 to 2005.

[Graph 14](#) shows price movement in Chinese paper industry measured by Producer Price Index (PPI), which is the average change over time in the selling prices received by domestic producers. It shows that there was a sudden price jump in 1995. During the period 1996-1997, the price paper and paperboard started to slowly decrease and then became relatively stable for 1999-2004.

Chinese newsprint production and consumption increased rapidly after 1995. Based on the Almanac of Chinese Paper Industry, the domestic production was 1.24 million tons in 2000, and increased to 3.41 million tons in 2005, more than doubled. From 2003 to 2004, the production increased by 45%, due to the start of new capacity. New and advanced machines are built rapidly in China. For example, average annual growth rate for newsprint production from 2001 to 2005 is 19.35%, although newsprint consumption for the same period grew at an annual rate of 14.48%. In 2005, the newsprint production for the first time exceeded consumption (3.2 Mts), as shown in [Graph 15](#).

[Graph 16](#) shows the dramatic growth in China's newsprint consumption in the past decade. Over the past 10 years, the average annual growth rate of Chinese demand for newsprint reached almost 14%. By comparison, the growth rate of the world within the same period is only 1.9%, as shown in [Graph 17](#). However, in 2002, the per capita consumption of newsprint in China was only 1.6 kg/year, which was far below 6.3kg/year, the average level of world consumption. In most countries of the western world, it was close to 40kg/year in 2002.¹¹ Hence, the Chinese market still has great potentials for newsprint. The export of Chinese newsprint has always been very small. Based upon the FAO data, from 1961 to 2002, the biggest Chinese annual export of newsprint was

¹⁰ It can be easily found out by seeing the FAO data.

¹¹ Data is collected from Almanac of Chinese Paper Industry 2003.

merely 0.12 million Mts in 1995. China spent \$56.35 million in importing newsprint in 2004.

At the end of 2002, there were 162,527 printing companies in China. 150,000 different types of books and more than 8,000 journals were published in 2002. The Press & Publication Administration of the PRC estimates that the annual publication of books and journals will increase 7% per year. Hence the demand for printing and writing paper will continue to rise fast.

As shown in [Graph 18](#), in 2002, China consumed 9.70 million Mts of printing & writing paper, with a 13.9% average annual growth rate in the past decade.¹² [Graph 19](#) shows the trend of Chinese consumption of printing & writing paper. The printing & writing paper production in China grew at an average yearly rate of 12.4% from 1998-2002, and reached 9.2 million Mts in 2002. Based on the Chinese Almanac data, more than 98% of the demand for printing & writing paper was met by domestic production in 2002.

The domestic demand for Kraft Linear is high. About a decade ago, Chinese producers mainly used the recycled pulp and other fiber pulp to produce linear board. Thus, the demand for Kraft Linear relied mostly on import. In recent years, however, Chinese producers purchased advanced machines, and the capacity increased rapidly. Consequently, the import of Kraft Linear was stable. For example, the import of Kraft Linear was 1.12 million Mts in 2000, 1.26 million Mts in 2001, and 1.25 million Mts in 2002, respectively. While the domestic production of linear board increased, most of which were Kraft Linear, to 4 million Mts in 2000, 4.6 million in 2001, and 6 million Mts in 2002, respectively.¹³

The imports of Kraft linear and high-strength corrugated paper have experienced an increasing trend during 1992-1999, a decrease during 2000-2001 and then a rise again since 2002. The ratio of the linear board import to the total import of paper and paperboard grew from 22.64% in 2001 to 26% in 2005. The import of linear board reached 1.36 million Mts in 2005 while the export was only 0.02 million Mts. Due to the

¹² This number is 9.37 according to the Chinese Almanac data.

¹³ Data is collected from Almanac of Chinese Paper Industry 2003.

lack of high quality fiber materials, the reliance on imports for Karft linear will continue in the future.

The world market share of Chinese production, import, and consumption of other paper and paperboard are expanding sharply.¹⁴ As can be seen in [Graph 20](#), in 2002, the world market share of Chinese production and consumption reached 14.51% and 16.67%, respectively. This shows that the demand for “advanced” paper and paperboard increased with the improvement of the living quality of Chinese people. For example, the household and sanitary paper, as well as the wrapping and packing paper and board, were of high demand. China ranked No.2 in household & sanitary paper consumption in the world, after the USA. The Chinese consumed 3.1 million Mts H&S paper in 2003, an increase of 8% comparing to 2002. The Chinese imports accounted for 17.32% of world market share in 2002.

4. Demand Pattern and Trends

China’s economic transition started in 1979 and has been characterized by rapid economic growth, gradual transformation into a market system, and increasing integration into the world economy. During the period of economic transition, many traditional Chinese industries have experienced dramatic changes responding to both domestic and international pressures. As a good representative of Chinese traditional industries, most of the companies in the paper and paperboard industry were state-owned and thus operated under the government planning system that did not use profits or return on investment as the measure for success. Some companies were even receiving government subsidies in order to survive. The economic transition pushed these companies to the market, which consisted of both active domestic companies and international producers. Consequently, given the joint effects of increasing international competition and market reforms, the demand pattern has important implications for Chinese paper and paperboard industry.

¹⁴ Basing on the FAO definition, “Other Paper and Paperboard” consists of two categories: wrapage & package paper and board, and household & sanitary paper.

In a related study conducted by Li, Luo, and McCarthy (2005), they found that for domestically made paper and paperboard products, the estimated income elasticity of the demand is about 1, indicating that the demand increases at the same speed of the economic growth.¹⁵ But the demand does not respond to own-price in the early stage of economic reform before 1993; and it becomes about -0.7 as the reforms deepen. This outcome seems plausible since under the government planning system the economy was mostly operated based on non-market oriented criteria thus the demand is not very sensitive to price. The situation changed after the market economy prevailed in China however. The demand response to international price shows the same pattern: it becomes more sensitive in the second stage of economic reform starting from 1993 with the elasticity of about 0.6.

The demand for imports is also about unitarily elastic to economic growth. The estimated own-price elasticity is -0.6, which indicates that the demand for imported paper and paperboard respond negatively to the increase of international price. As economic transition progresses, the response appears to be even more inelastic. The probable explanation was the difference in quality between domestically made and imported products. They believed that the Chinese paper and paperboard market had formed a reliance on specific grades of high quality paper and paperboard. When this reliance increases, the demand becomes less elastic. The relatively high income elasticity and low price elasticity of the demand for imports indicates that China has huge market potential for international producers in this industry.

With the investment in advanced technology and machines, China's ability of producing high quality paper and paperboard will increase and thus the reliance of high quality products on international markets may decrease in the future. However, with the rapid increase in demand, the lowered tariff due to WTO requirements, decreasing shipping costs and appreciation of Chinese currency, the Chinese markets still have great potential for international producers, especially for high quality products.

¹⁵ In economics, elasticity is the ratio of the incremental percentage change in one variable with respect to an incremental percentage change in another variable. One typical application of the concept of elasticity is to consider what happens to consumer demand for a good (for example, a product) when prices increase. As the price of a good rises, consumers will usually demand less of that good, perhaps by consuming less, substituting other goods, and so on. The greater the extent to which demand falls as price rises, the greater is the price elasticity of demand. When the income rises, consumers tend to demand more. So the greater the extent to which demand rises as income rises, the greater is the income elasticity of demand.

In the study, they also found that the demand for domestic products appear to respond to the international price with an estimated cross-price elasticity of 0.59. This is because imports can certainly be used as substitutes for domestically produced products. On the other hand, the demand for imports is not sensitive to domestic price, indicating that domestically made products may not be used as substitutes for imports. This is not surprising since the imported products are often of high quality, which Chinese producers may not be able to produce or their capacity is significantly restricted on these grades of paper and paperboard.

It is very distinctive that, as economic transition progresses, the Chinese economy is becoming an increasingly market-oriented system. This is the cause of the increasing sensitiveness of demand for paper and paperboard to both domestic price and international price. As the Chinese economy becomes increasingly integrated into the world economy, its pulp and paper industry will also become an active playfield for international producers and investors.

Another factor that influences the demand in China is tariff. China lowered its tariffs for pulp and paper products to 15-20% in 2001 prior to WTO accession. Based on the WTO requirements, the tariff continued to be lower ([Table 9](#)). By 2006, it reached 5-7.5% for most products, and 2% for some products. Market pulp and waste paper has been no tariff since 1999. In 2006, the tariff rate falls to 5% for newsprint and coated paper. In 2002, China has abolished the sliding scale tariffs on newsprint, replacing it with a flat import duty of 8.5%.¹⁶ This rate remained in place during 2003-2004 and dropped to 7.5% in 2005 and finally 5% in 2006. The tariff on household and sanitary paper has decreased from 11.3% at the beginning of the WTO accession to finally 7.5% in 2003. Printing & writing paper and wrapping & packing paper currently have different tariff rates, the highest tariff is 7.5% and the lowest is 2% after China entered WTO. The grade with the most dramatic decrease in tariff is cigarette paper, reduced from 32.5% in 2002 to 7.5% in 2005.

5. Capacity and Foreign Direct Investment

¹⁶ The sliding scale duties levied a higher duty on cheaper priced imports in order to curb imports of low-priced newsprint.

In 2005, 11 provinces in China reached paper and paperboard production of 1 million Mts or higher. They were Shandong, Zhejiang, Guangdong, Henan, Jiangsu, Hebei, Fujian, Hunan, Anhui, Sichuan, and Guangxi. They contributed about 88.62% of the total paper production in China.¹⁷ Among them, the top 4 provinces in paper production were Shandong, Zhejiang, Jiangsu, and Guangdong. The eastern region of China takes a lead in total production (73.3%), followed by the middle region (21.5%), and the western (5.2%). Shandong's paper production has been on the top in China for eight consecutive years (23% in 2005).

In order to increase competitiveness and production efficiency, the Chinese government started to close down small paper mills and encourage merges and acquisitions. At the same time, Chinese domestic producers are increasing their own capacity in order to meet the demand. The recent capacity expansion is remarkable, e.g., Chenming Paper has the capacity of 2.5 million Mts per year and is ranked as one of the top 50 paper producers in the world in 2006; Huatai Paper can produce 1.2 million Mts of newsprint per year at the end of 2006. Big companies invested in large and advanced machines and new pulp-making system, like the new machines in Nanping, Qiqihaer, and Shiyan, as shown in [Table 10](#). At the end of 2002, the annual capacity of Chinese newsprint producers added up to 2.4 million tons. Over 80% of the producers have the capacity of more than 50 thousand Mts per year, as shown in [Table 11](#).

According to Almanac of Chinese Paper Industry 2003, the capacity of Chinese pulp production will be 25.15 million Mts in 2020, which is 23.15 million Mts more than that in 2001, as shown in [Table 12](#). The paper capacity is predicted to be 95 million Mts in 2020, which is 57.65 million Mts more than that in 2002. The Chinese consumption of paper and paperboard is predicted to be 100 million Mts in 2020. Hence, the USA, Europe, and China will be the top three players for paper and paperboard in the world market by 2020. It is estimated that \$76.8 billion is needed in investment for the new capacity by 2020. Additionally, the predicted investment for rebuilding old mills is another 40 billion dollars, making the total investment is approximately \$117 billion dollars.

¹⁷ Data is collected from the Annual Report of Chinese Paper Industry 2005.

This rapid increase in capacity helped China to rely less on the international market for paper and paperboard products. However, it also puts increasing pressure on price as supply expands. Chinese producers are facing challenges in reducing costs. For example, Huatai, the top newsprint producer in China, achieved production cost at \$375/Mt, which is close to that of big international producers.

As the paper and paperboard market opens to the world, many international paper companies have invested in China, for example, Indonesia-based Asia Pulp & Paper Co., UPM-Kymmene Co. (Finnish), and Stora Enso (Finnish-Swedish). Recently, American International Paper Company invested 0.48 billion USD to establish a joint venture with Shangdong Sun Paper Co., Ltd. Rizhao Senbo Pulp received 1.2 billion USD investments from RGM International to build a plant with the wood pulp capacity of 1 million Mts per year. In Jiangsu, the newly built UPM-Kymmene (Changshu) plant, Stora Enso (Suzhou Zixing) plant, Hongkong Lee & Man (Changshu) plant, and other plants will create a new capacity of 1.8 million Mts per year. Ningbo Zhonghua Paper in Zhejiang province is now building a plant with the capacity of 2 million Mts per year.

In order to attract foreign investment, the Chinese government offered foreign investors many favorable policies. For example, according to the “Guidance Catalog for Foreign Investors Investing in Industries”, which was published in April 2002, foreign investors can invest in the business with annual capacity of 0.3 million Mts or more for chemical wood pulp, 0.1 million Mts or more for mechanical wood pulp (with some requirements on forest plantation). And foreign investors can invest in producing high quality paper and paperboard.

Foreign companies can enjoy tax exemption in the first two years, and a half-tax reduction in the subsequent 3 years. Foreign companies with plantation operation in China can have another 15-30% tax reduction in the subsequent 10 years.¹⁸ Generally, preferential tax rate for foreign investment is 15-24%, but for domestic firms is 18-27%. However, the preferential tax policy for foreign investors will be stopped soon and a proposed unified tax rate of 25% will apply to both domestic and foreign firms.

In addition, the use of anti-dumping measure by the Chinese government may also make it more attractive for international producers to invest directly in China. In

¹⁸ Almanac of Chinese Paper Industry 2003

2003, China imposed 4-71% anti-dumping duties on the art paper imported from Japan and Korea for 5 years. In 2004, China started to levy 55-78% anti-dumping duties on the newsprint imported from Canada, Korea, and the USA for 5 years.

Because of the limited forest resources, China is adopting a new strategy known as “Forestry-Paper Industry Integration” to emphasize plantation and environment protection. In addition, this strategy is supposed to lower the reliance of wood resources in the international market and to reduce the costs of raw materials. China has the two favorable factors for plantation, relatively cheap labor and a large area of land suitable for planting.

6. Company Performance

In the above sections, we discussed the performance at the industry level. Although statistics about the whole industry provide a good picture at aggregate level, it is also desirable to study company performance. Based on data from publicly listed companies in the pulp and paper industry, we will discuss company performance in this section. Given the limited information from the data, we mainly focus on the pattern and trend of growth, profitability, and labor costs for companies in this industry.

The data, originating from annual reports of 27 listed pulp and paper companies in China from 1998 to 2005, were collected by Shenzhen GTA Information Technology Co Limited.¹⁹ [Table 13](#) shows the variable definitions and descriptive statistics.

(1) Revenue, Profit and Market Structure

As show in [Graph 21](#), the average annual revenue growth among the listed pulp and paper companies is quite high, in the range of 20-30%. There was a big jump in growth in 2000, and then the growth slowed down and became stable.

On the other hand, the average profit rate has been quite stable as well, as shown in [Graph 22](#), we can see that the profit rate mostly ranged from 20% to 25% from 1998 to 2005. From 1998 to 2002, the profit rates of main products in Chinese paper & pulp listed companies showed a slightly increasing trend, and then it displayed a decreasing pattern.

¹⁹ The data were purchased from Shenzhen GTA Information Technology Co., Ltd

During the five year period from 1998 to 2005, the number of publicly listed companies almost doubled, showing an increasing trend of diversified ownership structure, as shown in [Graph 23](#). Such a change represents a higher degree of market mechanism in operation and management. Therefore, together with increasing foreign direct investment in this industry, China's pulp and paper industry has shown a clear trend of transformation from the traditional command economy to a market-oriented system. The rising number of publicly listed companies may also signal higher degree of market competition.

On the contrary, the proportion of listed companies suffering loss has been growing and was close to 20% in 2005, as shown in [Graph 24](#). It is unclear, though, whether the declining profitability (or the increasing proportion of loss-making companies) is caused by rapid capacity expansion, or the heightened international competition.

(2) Labor Cost

China has its own comparative advantage of pulp and paper industry, i.e., mainly the relatively low labor cost. However, such an advantage is disappearing. [Graph 25](#) shows that the average yearly wage was arising rapidly, from ¥ 8145.69 in 1999 to ¥ 24417.95 in 2005, almost tripled in six years. In 2000, wage increased by 42.1% ([Graph 26](#)). Although wage growth slowed down after 2000, it still grew at 10-20% every year and appeared to be accelerating.

In the same period, the share of labor cost declined moderately, from around 9% to below 7% (see [Graph 27](#)). The declining labor share in the total cost is probably caused by the installation of large and modern machines, as well as by improved efficiency in management.

It is expected that with advanced technology, labor productivity will increase. This is confirmed by total revenue per worker, as shown in [Graph 28](#). The revenue per worker increased rapidly from 1999 to 2005, and almost tripled (see Table 14). However, the rising labor productivity was almost offset by the similarly increase in wages. As a result, profit per worker increased at a slower speed, from about 32,000 RMB (about

4,000 dollars) in 1999 to around 82,000 RMB (about 10,250 dollars) in 2005, as shown in [Graph 28](#).

The rapid increase of labor cost together with the declining labor share in the total cost indicates that the advantage of low labor cost in China is diminishing and becoming less important in the pulp and paper industry.

7. The Data

In this study, we have noticed the discrepancy and inconsistency among data available about China's pulp and paper industry, especially between the data from FAO and that collected from Almanac of Chinese Paper Industry. Generally, the FAO data give larger numbers about the Chinese pulp and paper industry, such as production, consumption, and import. For instance, as shown in [Graph 29](#), the total production provided by FAO is bigger than that in Chinese Almanac for almost all years.

The difference on import data is even big for all years, as shown in [Graph 30](#). The import data from FAO are almost twice as large as that from the Chinese Almanac for some years. A more dramatic difference can be found in export data, as shown in [Graph 31](#). Since later 80s, the discrepancy has been multi-times of that the export reported in China Almanac. One reason for such a large discrepancy should be the difference in data definition. However, the differences on data definitions from those two sources are not clear. Clearly, the inconsistency among data sources and the unclear reasons for it will no doubt cause difficulties for studying the Chinese pulp and paper industry.

8. Company visits

In 2006, we visited two paper mills in China, an old and small one with out-of-date technology and a modern and large one with advanced technology. These two mills represent the pulp and paper industry in China that spans over 50 years.

(1) A small traditional paper mill

On April 1st, 2006, we visited paper company called RIYIN Paper Co. Ltd. RIYIN is located in Hunan province, China. RIYIN represents those traditional small Chinese paper mills still in operation. Its main product is printing paper, writing paper, and offset paper for books. Its annual output of paper is in the range of 30,000 tons, yet still the largest among six paper mills in the county.

RIYIN was traditionally a state-owned enterprise. In 2001, it was transformed into a private enterprise as a result of restructuring state-owned industry in China. Due to the ownership transformation, the workforce was cut by 1/3, and annual output increased from 4,000 tons to 30,000 tons. Approximately 70-75% of its products are sold in China, while interestingly 25-30% are exported, primarily to the Middle East. RIYIN owns fixed assets of 52.8 million Yuan RMB. The manufacturing facilities and production techniques are very old and out-of-date. Their annual revenue was approximately 120 million Yuan RMB.²⁰ There are approximately 500 employees in the workforce.

RIYIN is located close to Dongting Lake, the second largest lake in China, with a large amount of reeds throughout the region. The local area can produce 120,000 tons of reeds per year. There are also wood resources such as poplar trees in the area.

Due to out-of-dated equipment and technology, pollution appears to be a big problem. We found that waste water and contaminants were released directly into the environment (see pictures), although we were told that they used 4% of its annual sales to treat pollutions.

(2) A large modern paper-making company

On April 13, 2006, with the help of Hunan provincial government, we visited a large-scale paper making company, Tiger Forest & Paper Group Co., Ltd, in Hunan Province. With the accompany of their Vice-president of R&D, we visited their most advanced machine and chemical pulping facility, as well as a transportation dock at the Dongting Lake.

Tiger was originally established in 1958. It has 23 subsidiary companies in forestry, pulp, paper and paperboard production, with the range of business from forestry, wood processing, pulp and paper production, power generation and heat supply, port

²⁰ USD \$1 equals approximately 8 Yuan RMB.

transport, scientific research and design, international trade, and real estate development, etc. It is one of the top 520 national enterprises on the list of the State Council. In 2005 it ranked 357th among the 500 largest Chinese companies, and the 4th in the industry.

It owned the 5 large production bases in difference locations in Hunan Province, 12 pulping lines with the annual capacity of 800,000 tons, and 28 paper making lines with the annual capacity of 800,000 tons, and produce over 40 different products involving over 100 different specifications, including newsprint, pigment paper, lightweight coated paper (LWC), bulk paper, writing paper, fine sulfate paper, sulfate liner, and sulfate card paper. These products sell in China, Asian and East African regions.

In 2005, Tiger produced 642,800 tons of paper and paper board, which was an increase of 18.8% over 2004. The total revenue was 4.2 billion RMB, an increase of 40%, and a profit of 0.19 billion RMB, an increase of 15% compared to that of 2003. By the end of 2005, the company owned total assets in the amount of 8 billion RMB, net assets of 3.2 billion RMB. It made an annual profit of more than 100 million RMB for five years in a row. The number of employees reached 10,026 in 2005.

The company has 1200 workers involved in R&D, and has developed 4 state level and 17 provincial level new products, applied for 27 patents, obtained 16 patents authorized by the state, while also conducted more than 370 scientific and technological projects.

The company's major strategies for sustainable development include:

(1) Integration of forestry and paper making. The company owns or controls 4.8 million Mus of forestry and 350,000 Mus of reed to supply the raw materials.

(2) Recycle waste paper. The company uses waste paper in production, currently recycles 170,000 tons waste paper annually.

(3) Environmental Protection. In order to decrease the pollution from production and save water, the company has built white water recycle system, as well as a system for comprehensive utilization of solid waste, for example, to generate heat and power, to produce cement and fertilizers.

The contrast of the two companies we visited is dramatic, representing drastic difference between traditional small paper mills and modern paper companies. As China becomes more integrated into the world market, especially with the importing of advance pulping and paper making technology, the Chinese pulp and paper industry will improve significantly in production efficiency and environment protection. It will be inevitable that out-of-dated machines and mills will be closed down, and be replaced by better technology. From the visit of those two companies, we can see the transition and the future of the pulp and paper industry in China.

9. Conclusion

In this report, we provide a review on the pulp and paper industry in China. Based on the industry level data and firm level data, we discussed the current stand, relative status in the world, patterns and trends, problems and potentials, as well as the transformation toward a market system, in this industry.

As the Chinese economy continues to grow, the demand for paper and paperboard products will grow at a fast pace. Although the capacity has been expanding rapidly, it may still not be able to meet the demand in the near future. Therefore, the market potential for paper/paperboard in China is huge, especially given the relatively low per capita consumption of paper and paperboard products compared to the developed countries. As demand increases faster than capacity expansion, it is expected that imports will dominate exports for foreseeing future, especially for pulp and high quality paper/board products. Yet, the rapidly increase in modern capacity will likely to gradually raise China's exports. Additionally, given the large number of small and out-of-date mills, many of those small mills will be shut down and closed, and industry consolidation will continue due to merge and acquisition.

The lack of high-quality raw materials remains to be the main constraint for the Chinese pulp and paper industry. Moreover, it is still an important task to close down those out-of-dated mills and machines and to transform domestic pulp and paper companies into a market oriented operation and management system. Another major challenge is environmental protection, given the foreseeing rising standards on

environment protection in China. Because of China's importance in paper and paperboard production and consumption in the world, it is inevitable that those changes will have an impact in the global pulp and paper industry. On the other hand, the integration into the world market and the engagement with foreign producers from developed countries should help to transform China's pulp and paper industry into a modern industry with new technology and advanced management system.

This report only provides a brief descriptive review for the pulp and paper industry in China. Given the complex product categories and usages, the review is by no means complete. Detailed studies are needed at a more disaggregated level in order to have a deep understanding. We leave them for future research.

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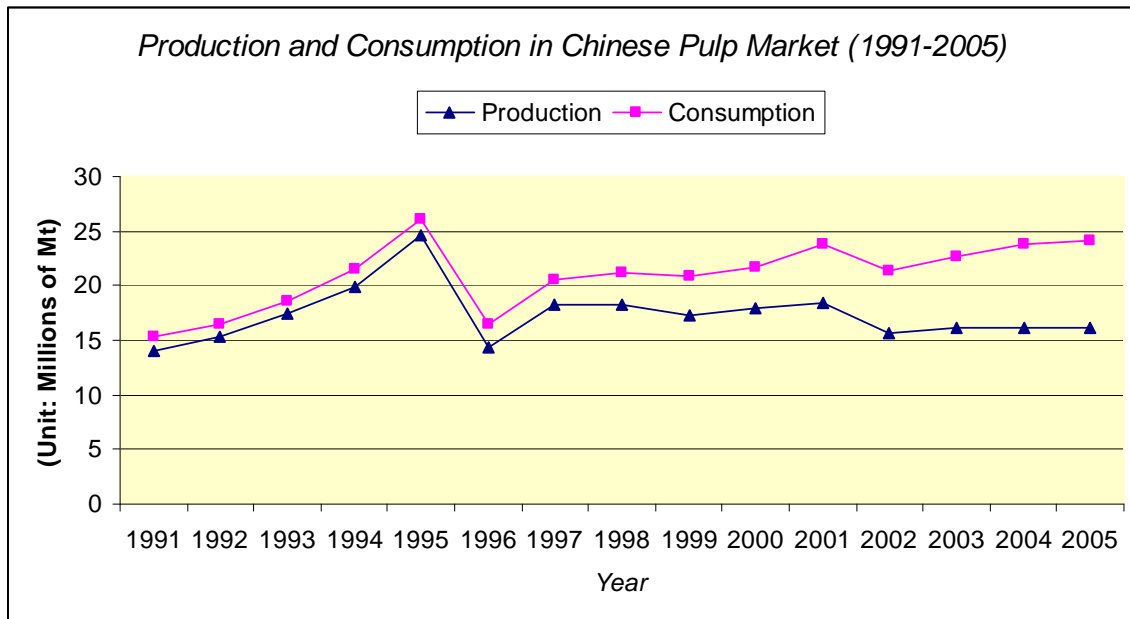
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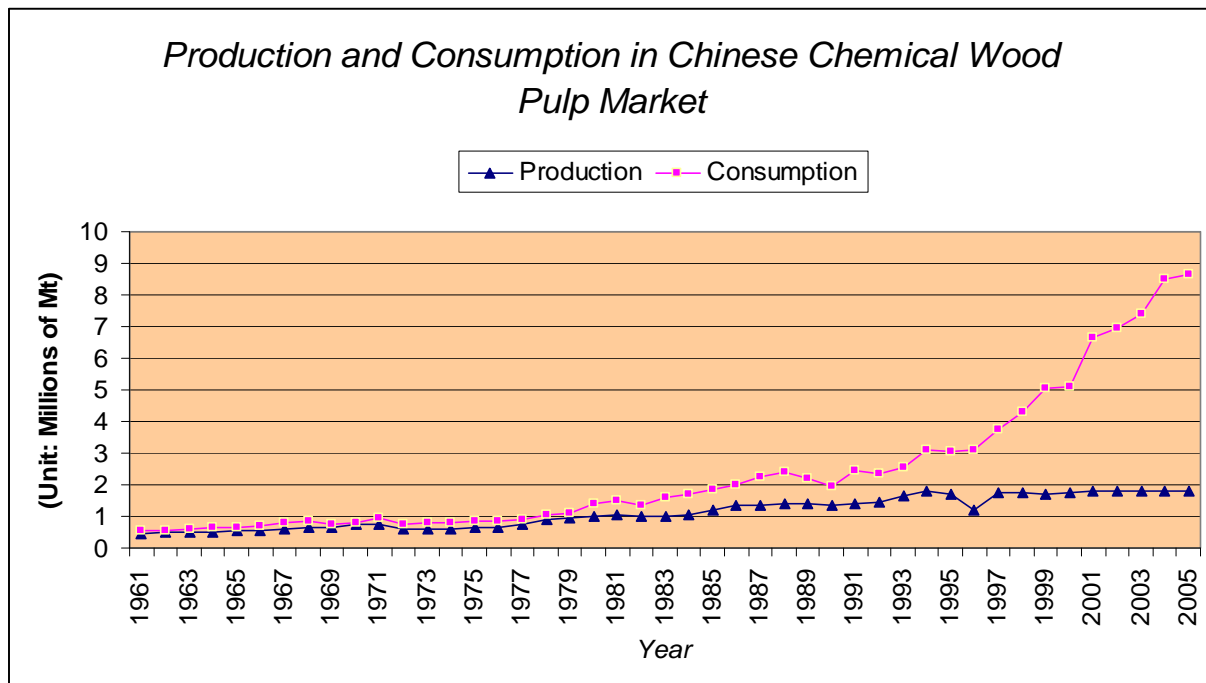
Graphs

Graph 1



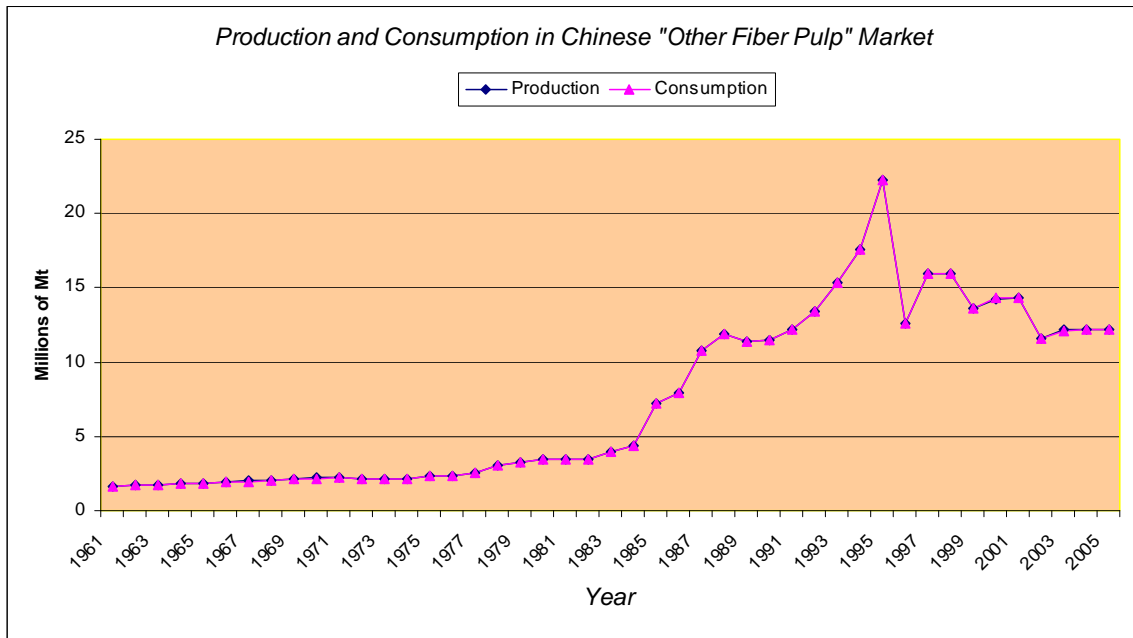
(Data Source: FAO)

Graph 2



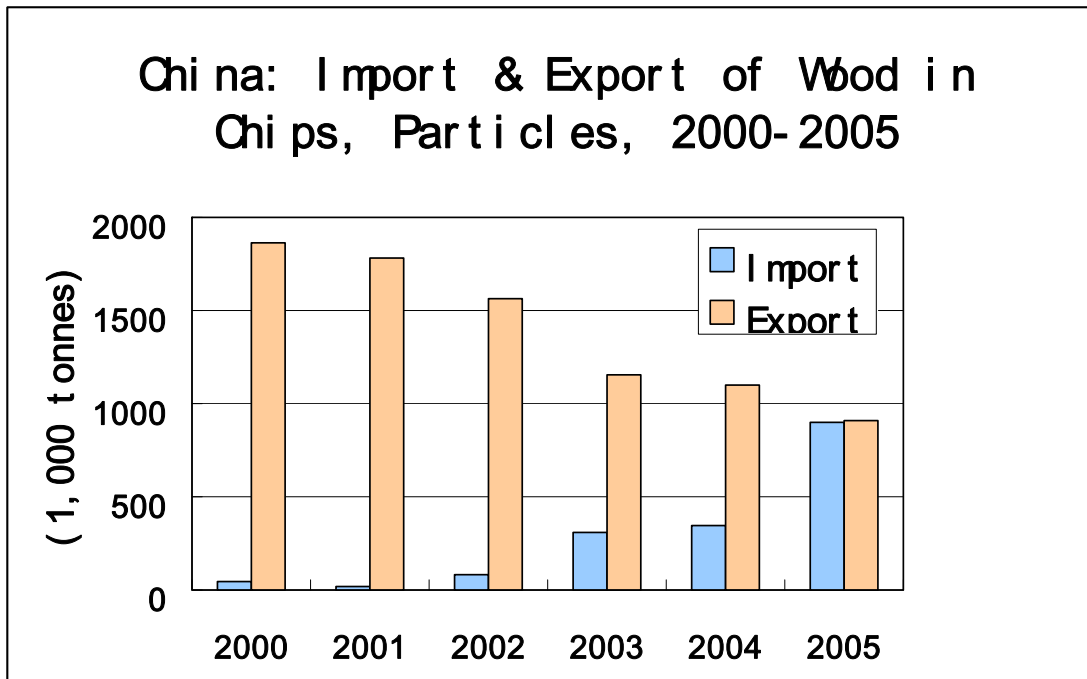
(Data Source: FAO)

Graph 3



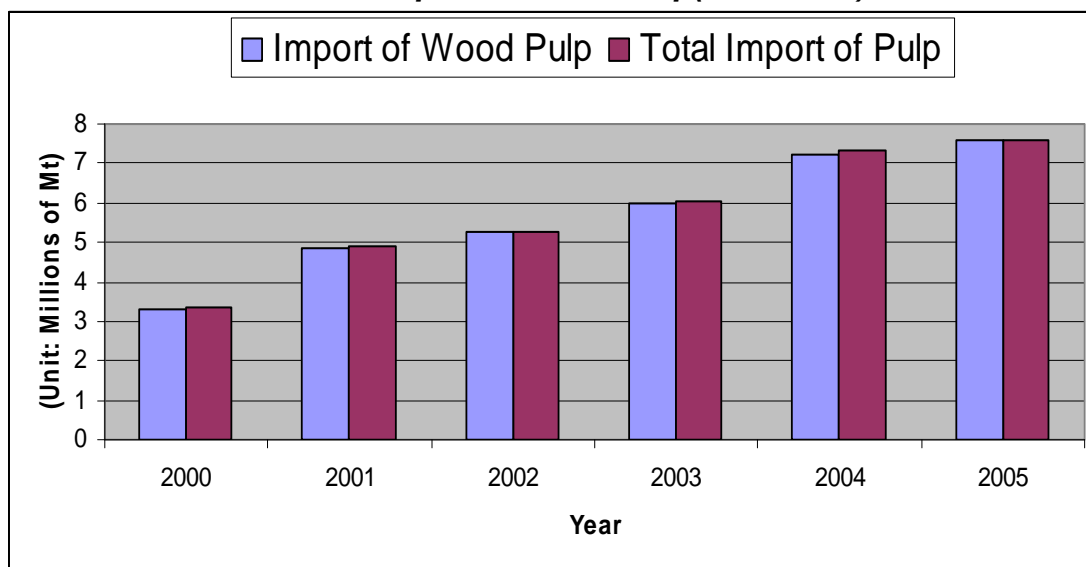
(Data Source: FAO)

Graph 4



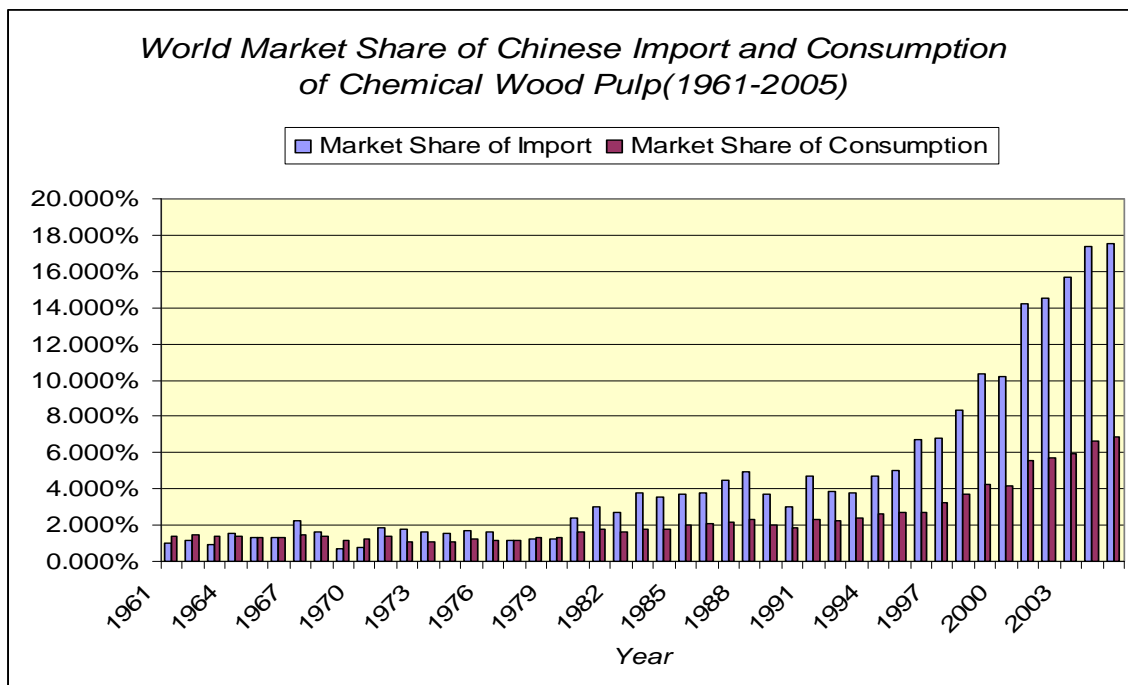
Graph 5

Chinese Import of Wood Pulp(2000-2005)



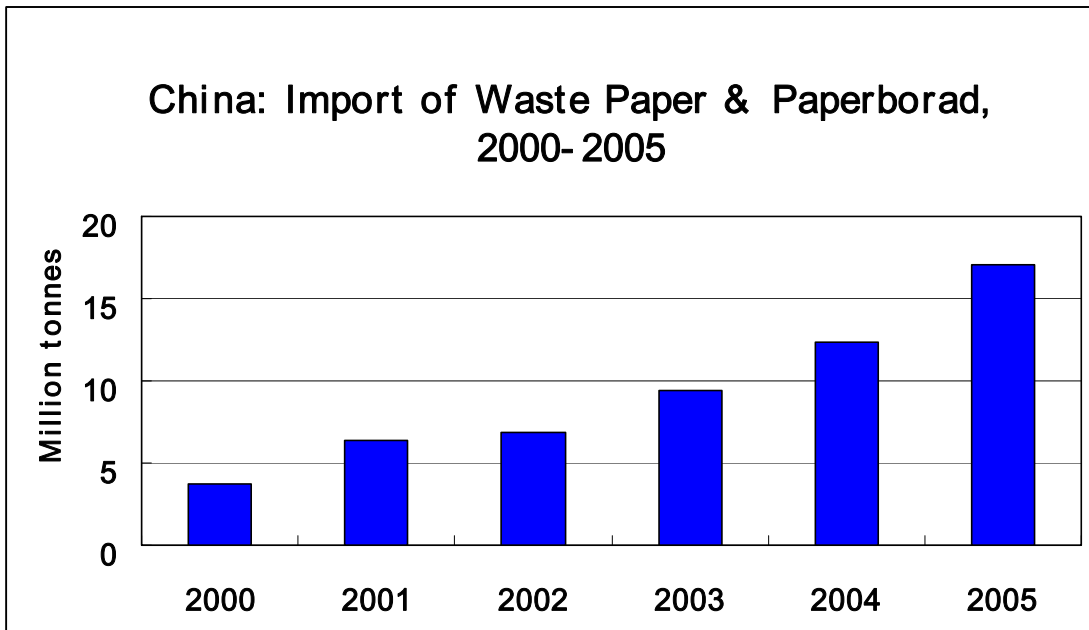
(Data Source: Chinese Paper Industry (J))

Graph 6

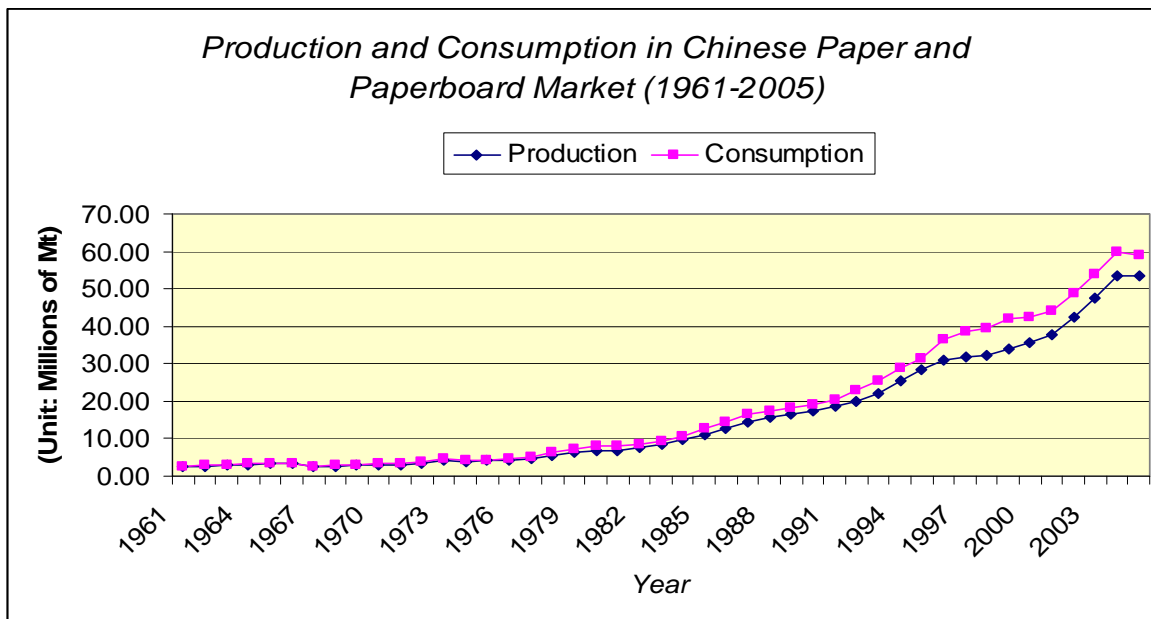


(Data Source: FAO)

Graph 7

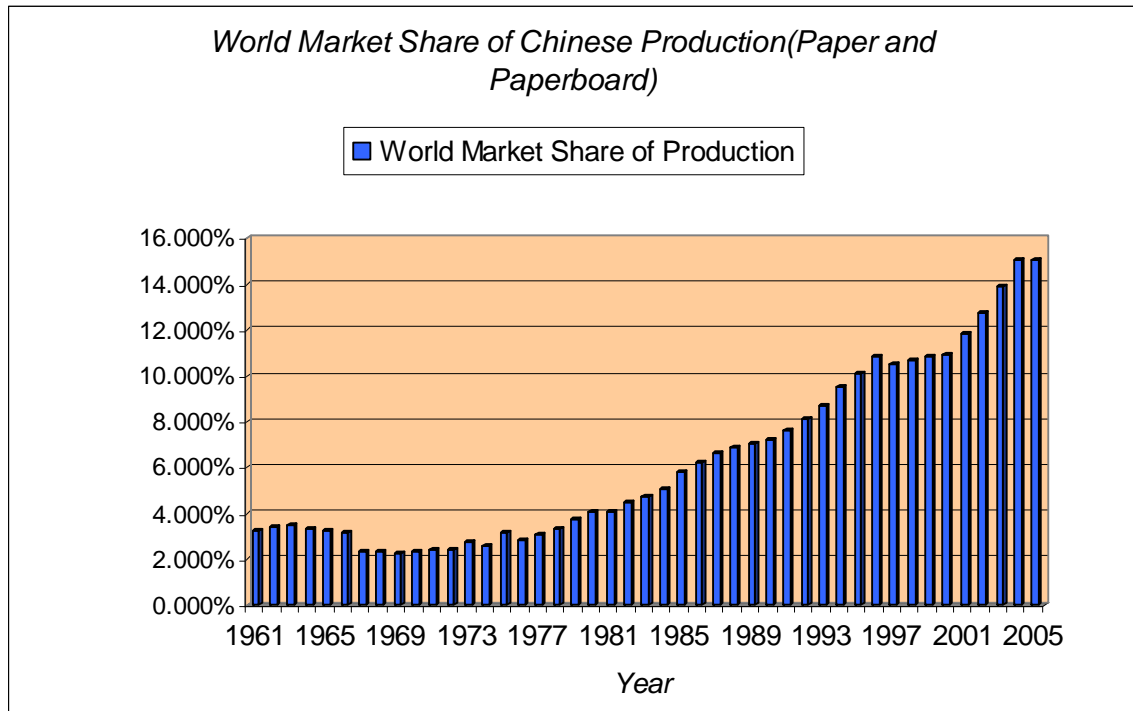


Graph 8



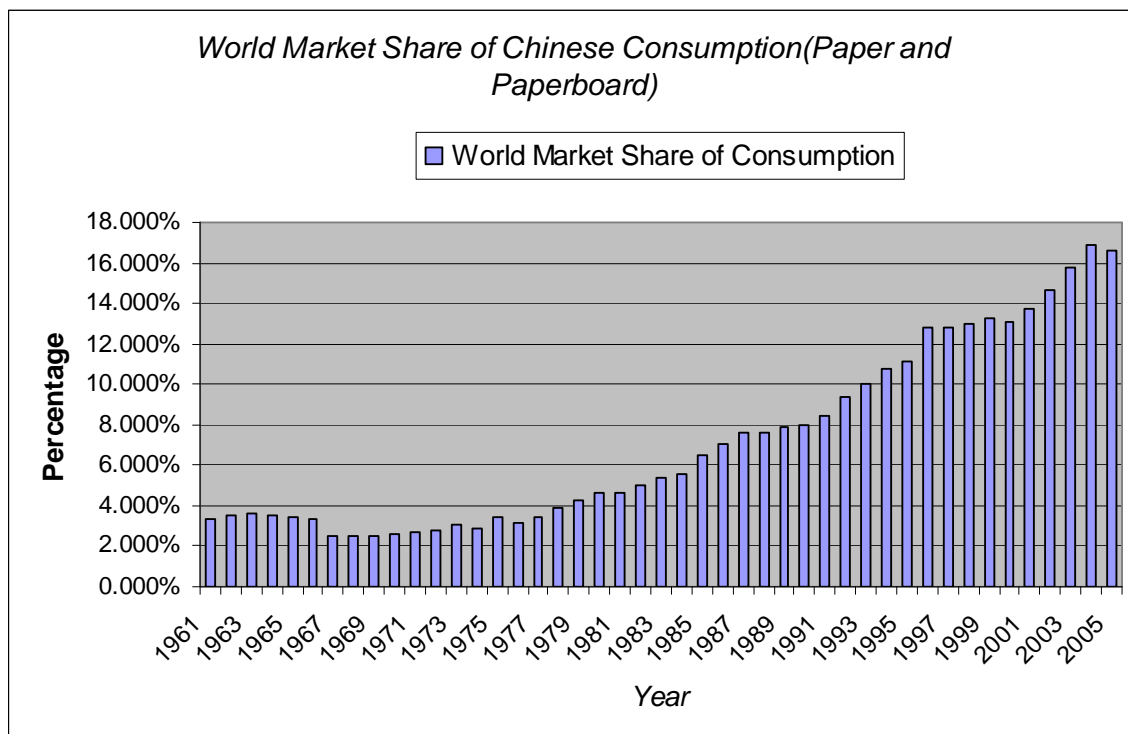
(Data Source: FAO)

Graph 9



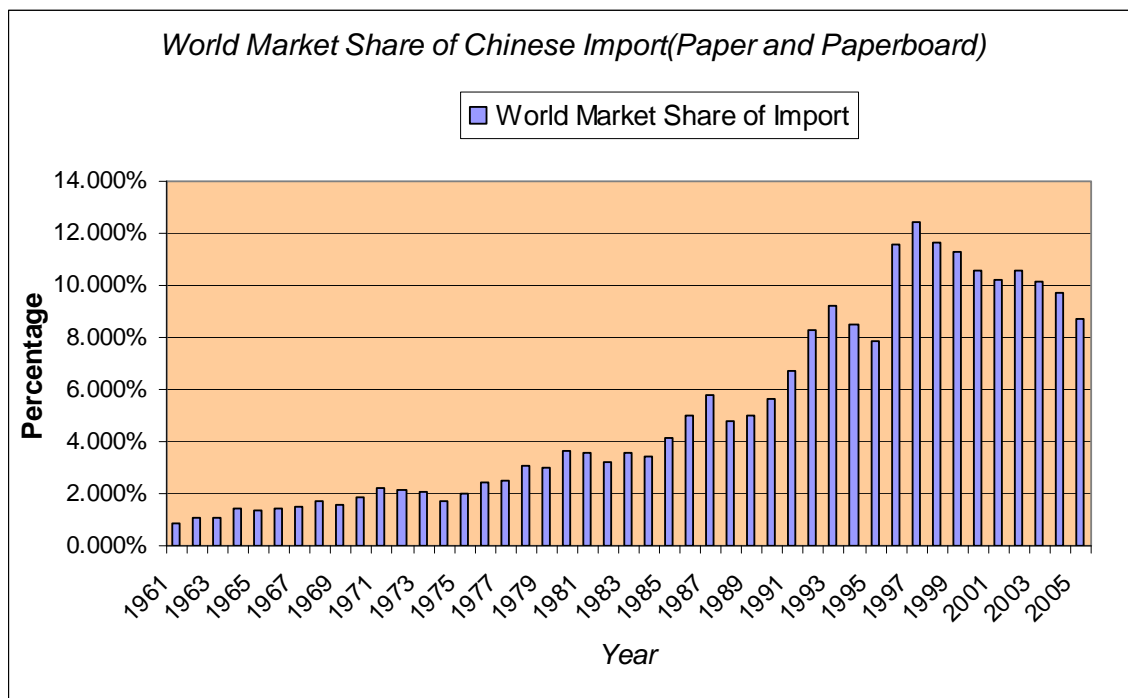
(Data Source: FAO)

Graph 10



(Data Source: FAO)

Graph 11



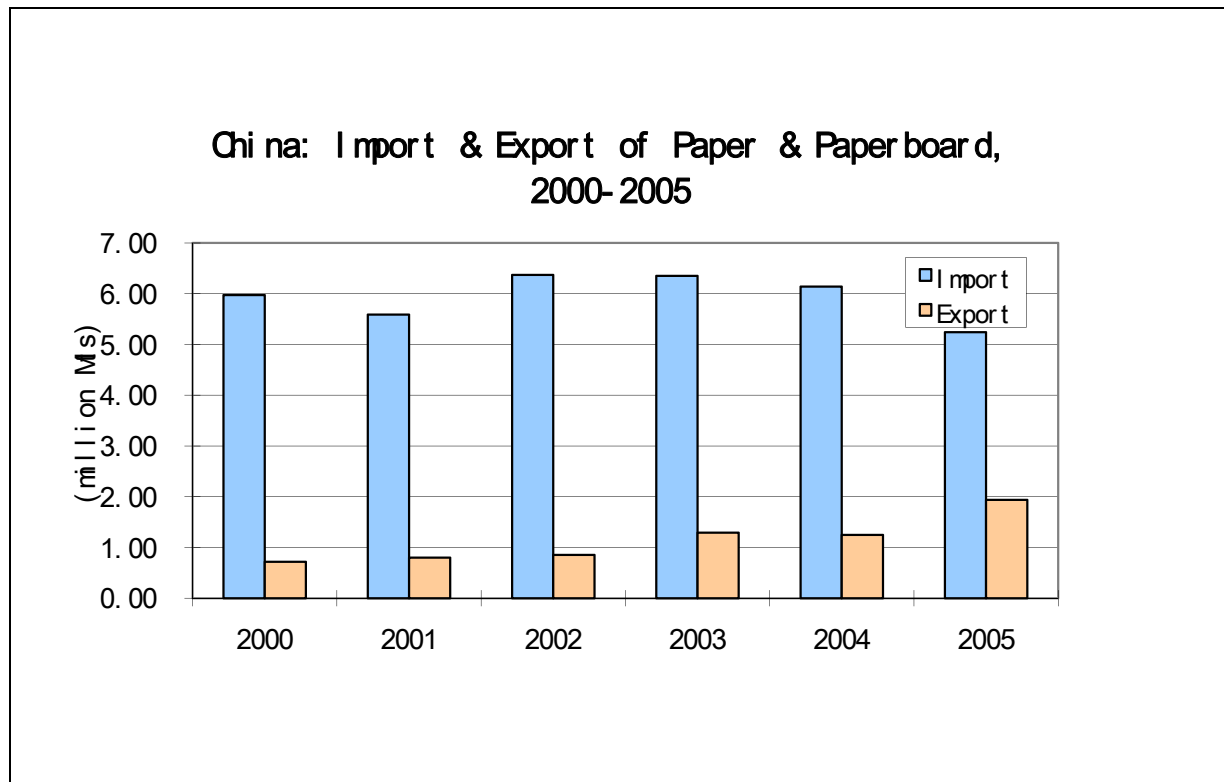
(Data Source: FAO)

Graph 12

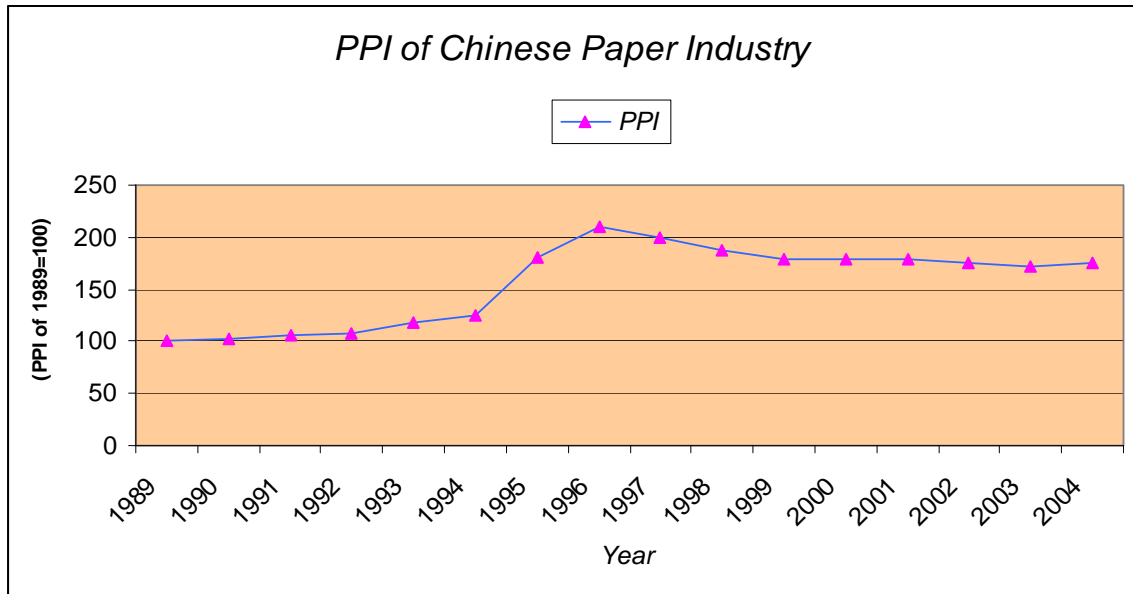


(Data Source: FAO)

Graph 13



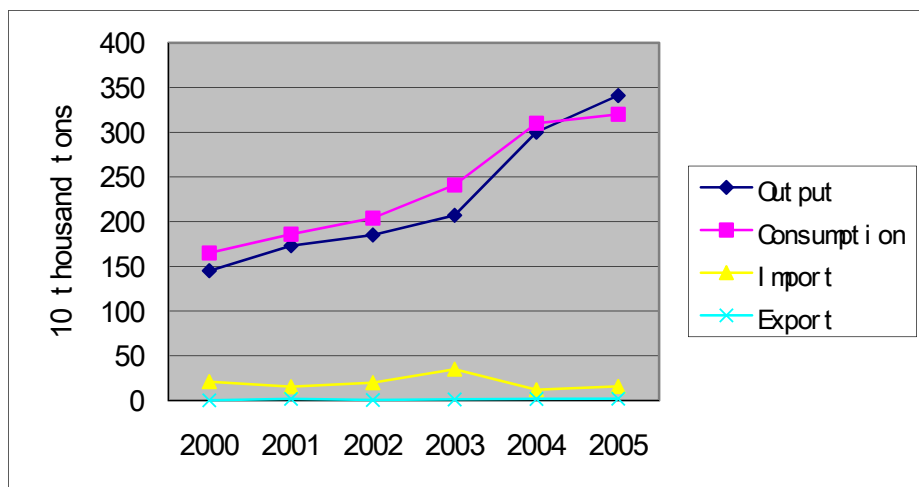
Graph 14



(Data Source: China Statistical Yearbook 2005)

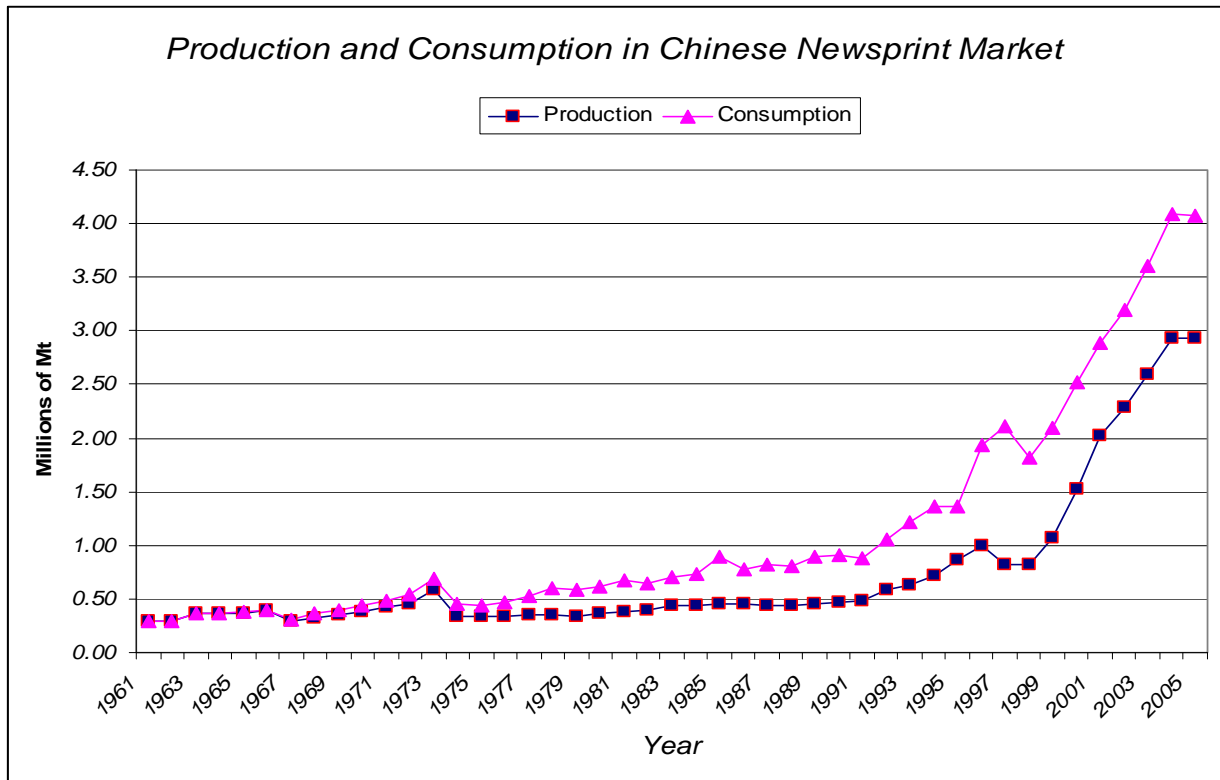
Graph 15

Chinese Newsprint Industry



Data source: Annual Report of Chinese Paper Industry

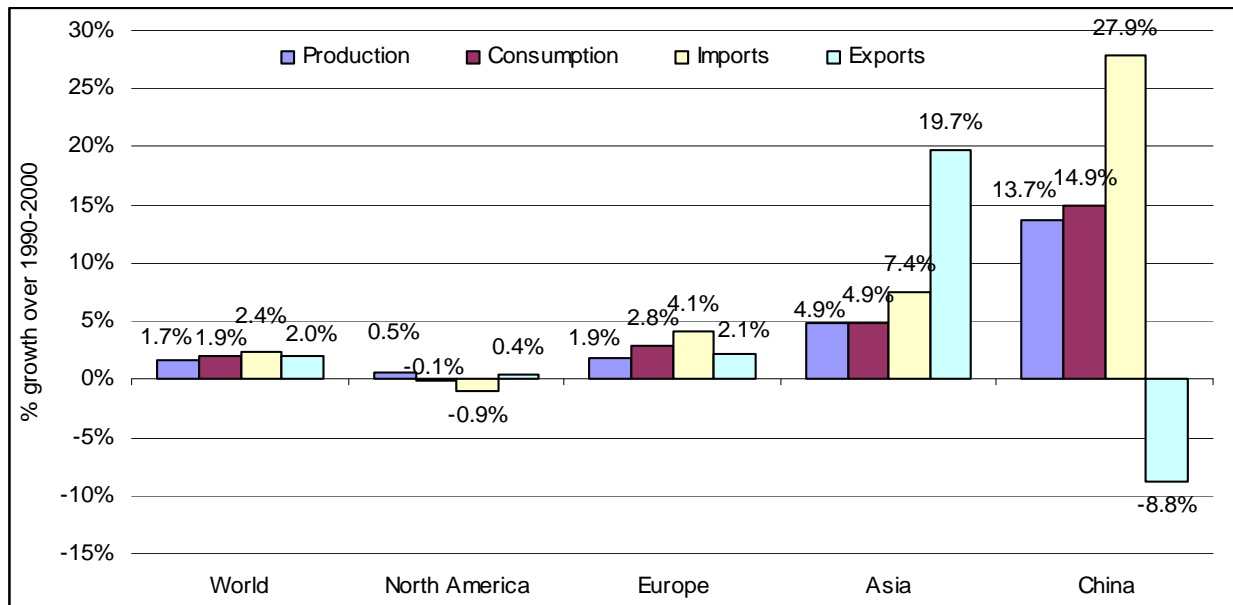
Graph 16



(Data Source: FAO)

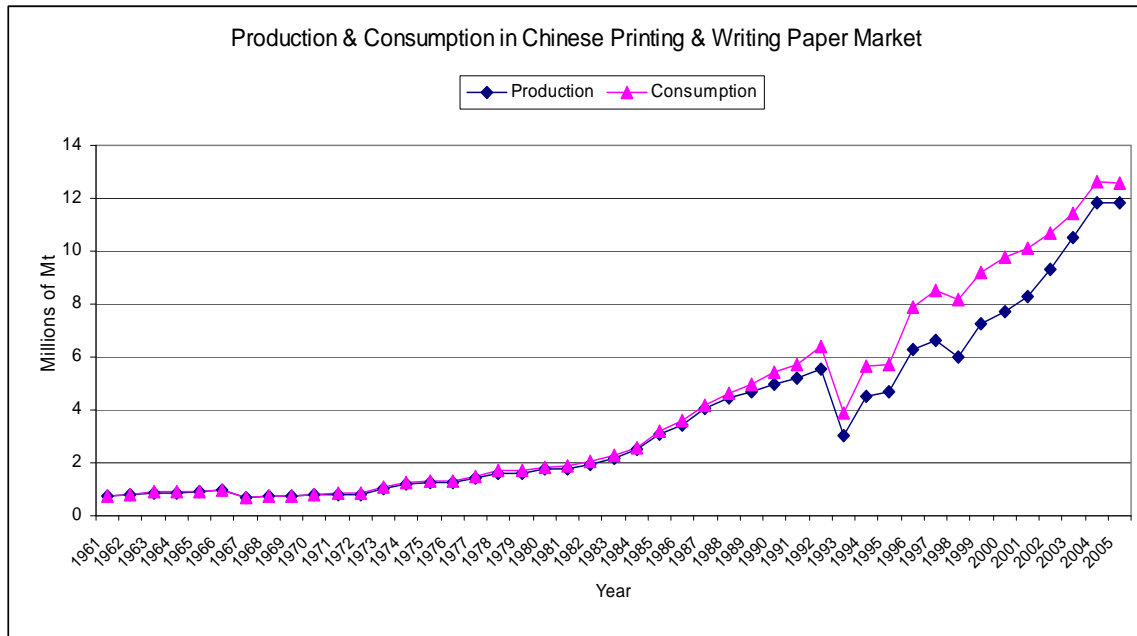
Graph 17

The Newsprint Growth Rate all over the World (1990-2000)



(Data Source: International paper and paperboard Fact book, different issues)

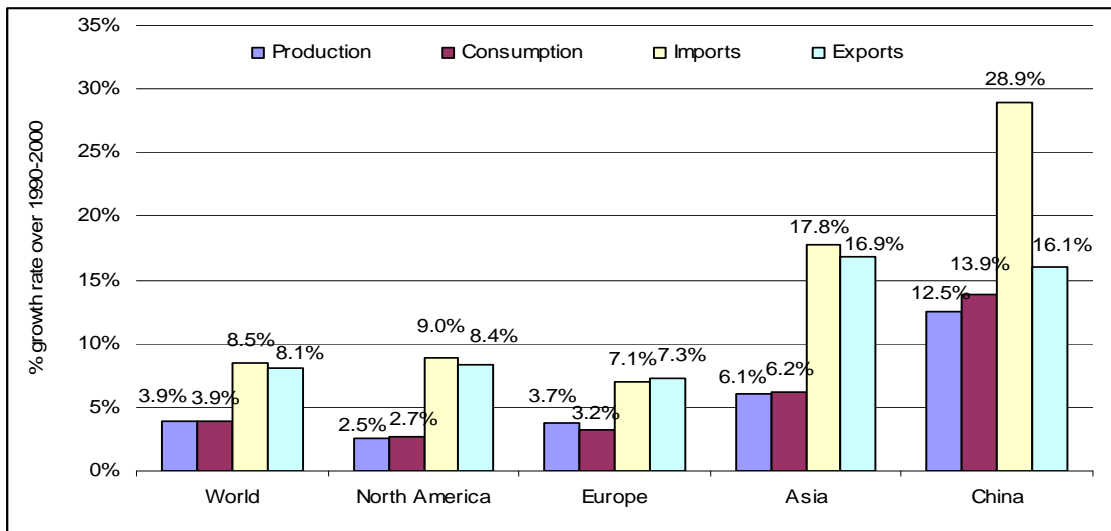
Graph 18



(Data Source: FAO)

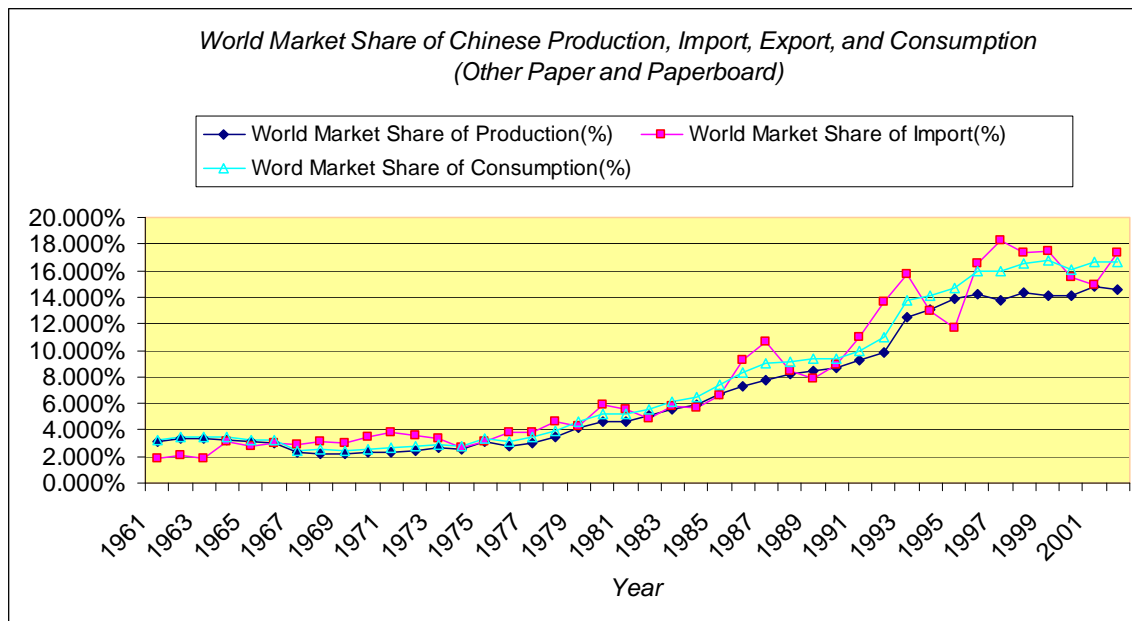
Graph 19

The Printing & Writing Paper Growth Rate all over the World (1999-2000)



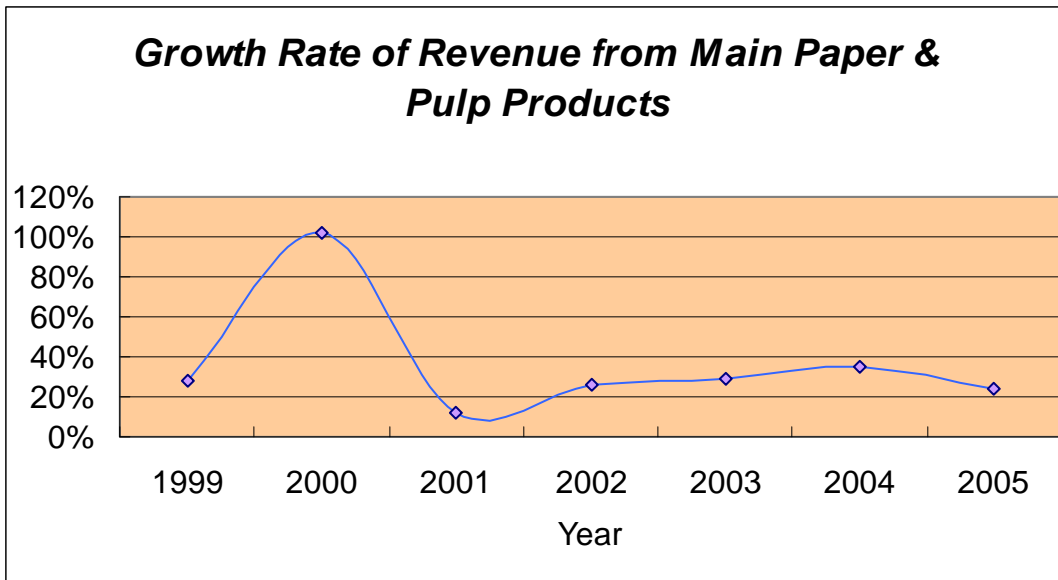
(Data Source: International paper and paperboard Fact book, different issues.)

Graph 20



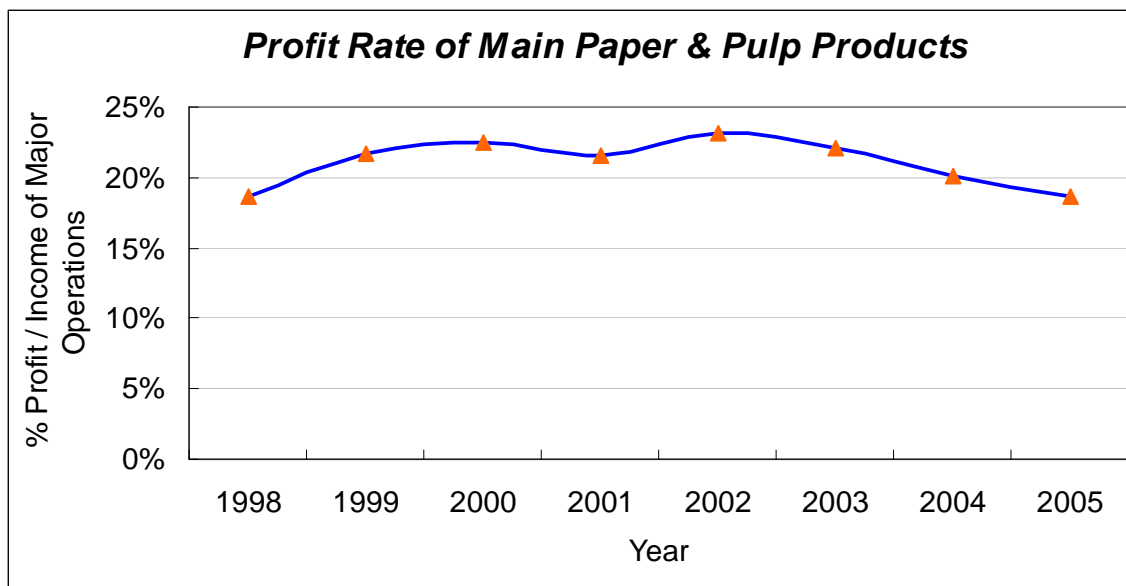
(Data Source: FAO)

Graph 21



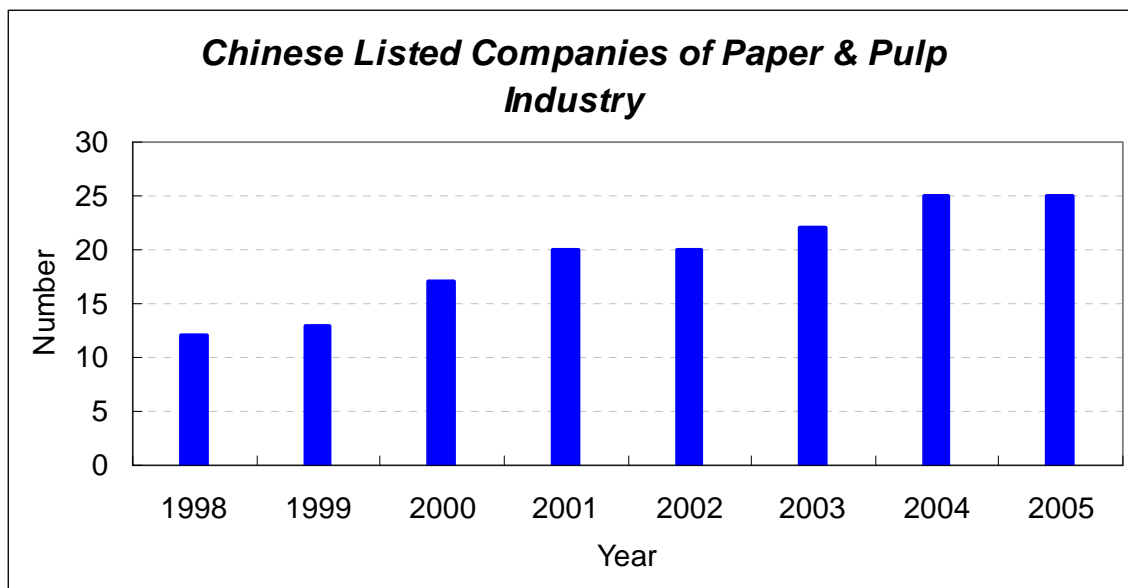
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 22



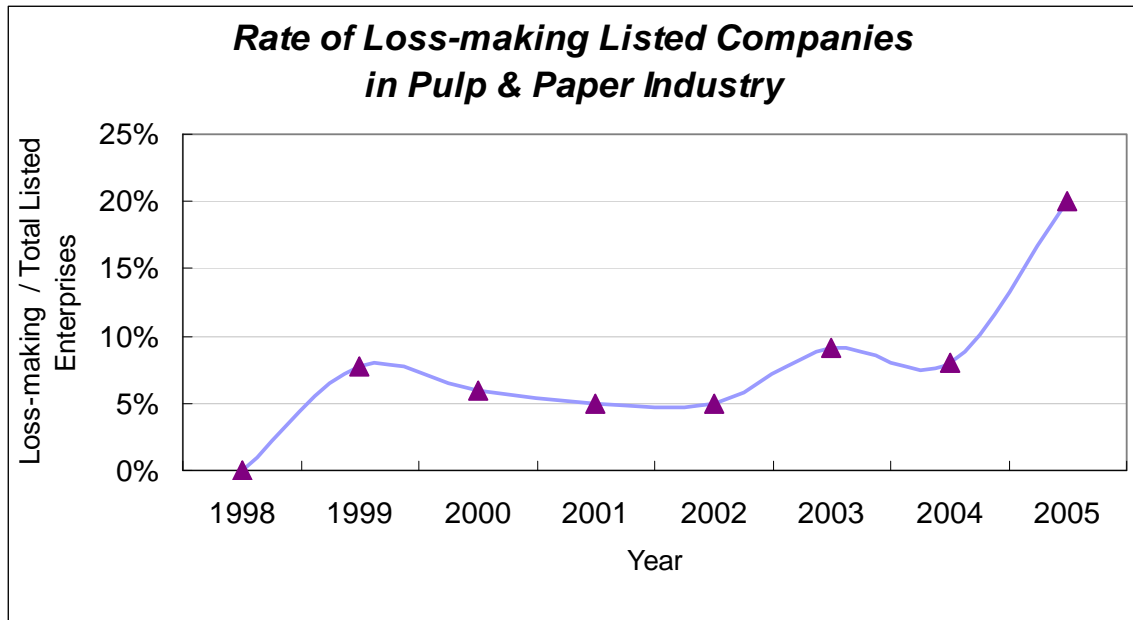
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 23



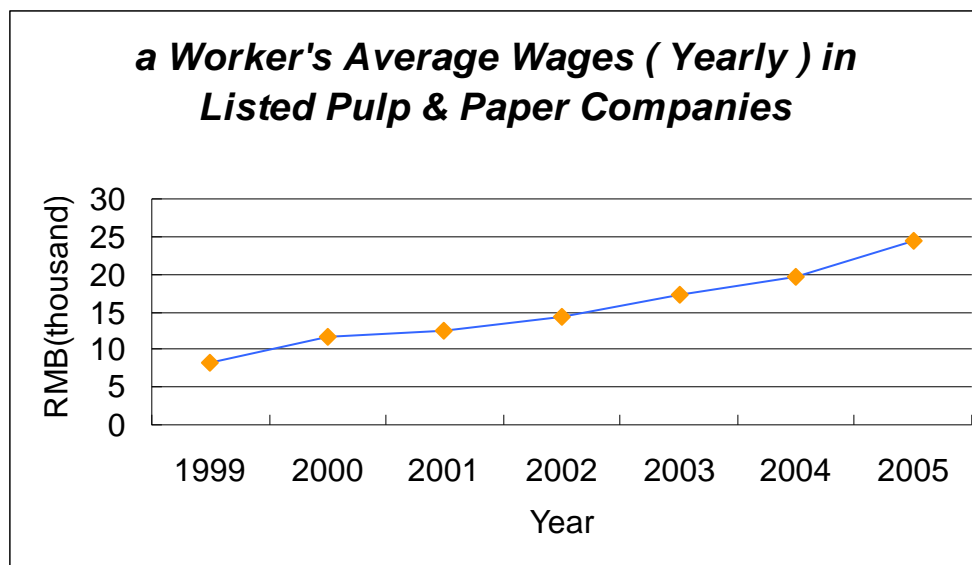
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 24



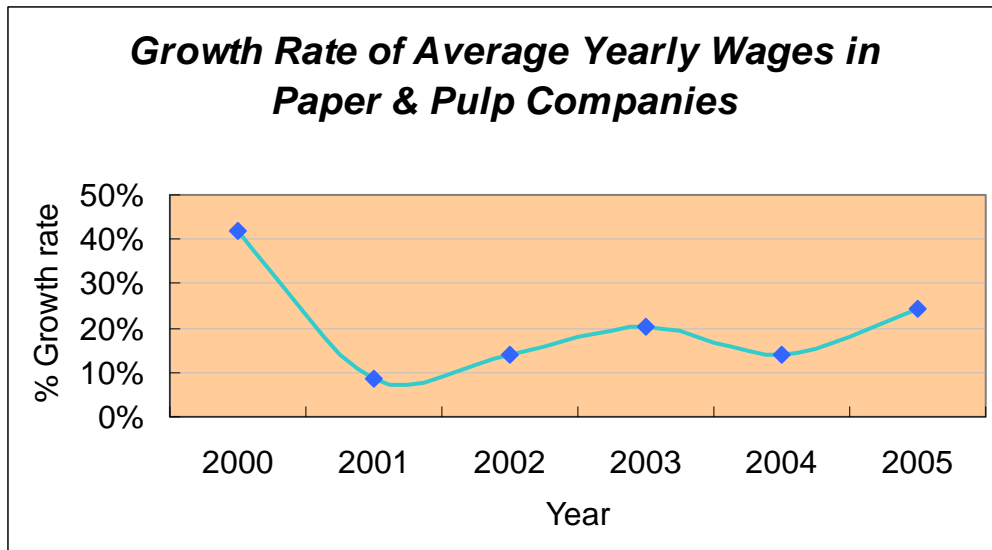
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 25



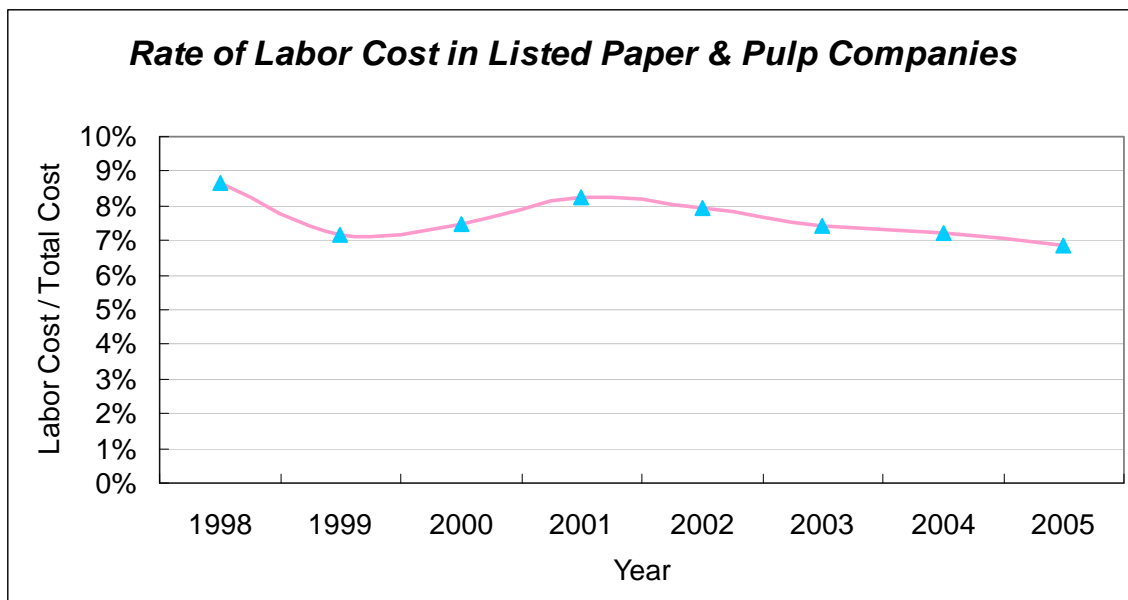
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 26



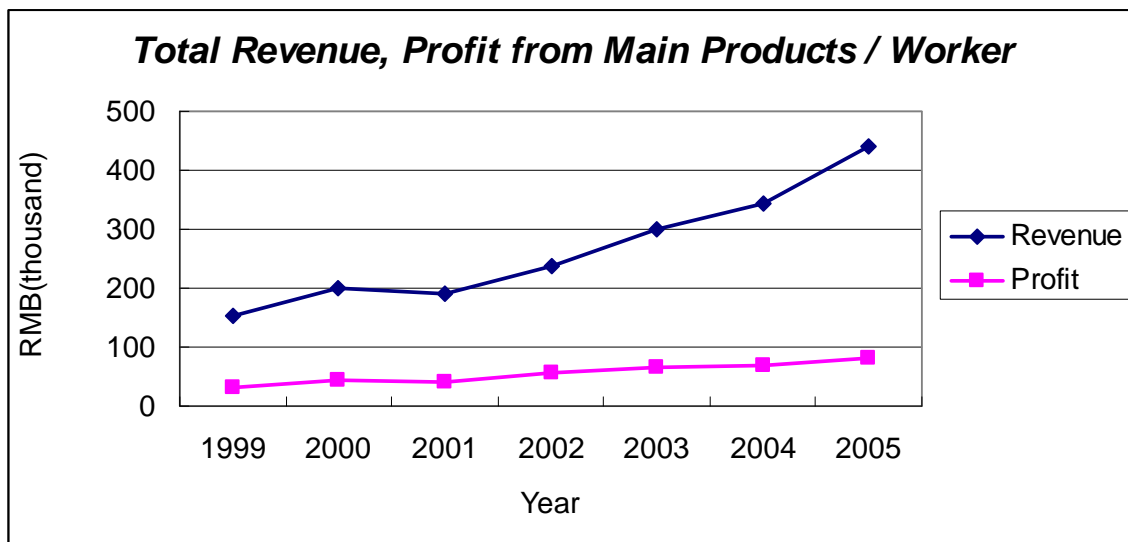
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 27



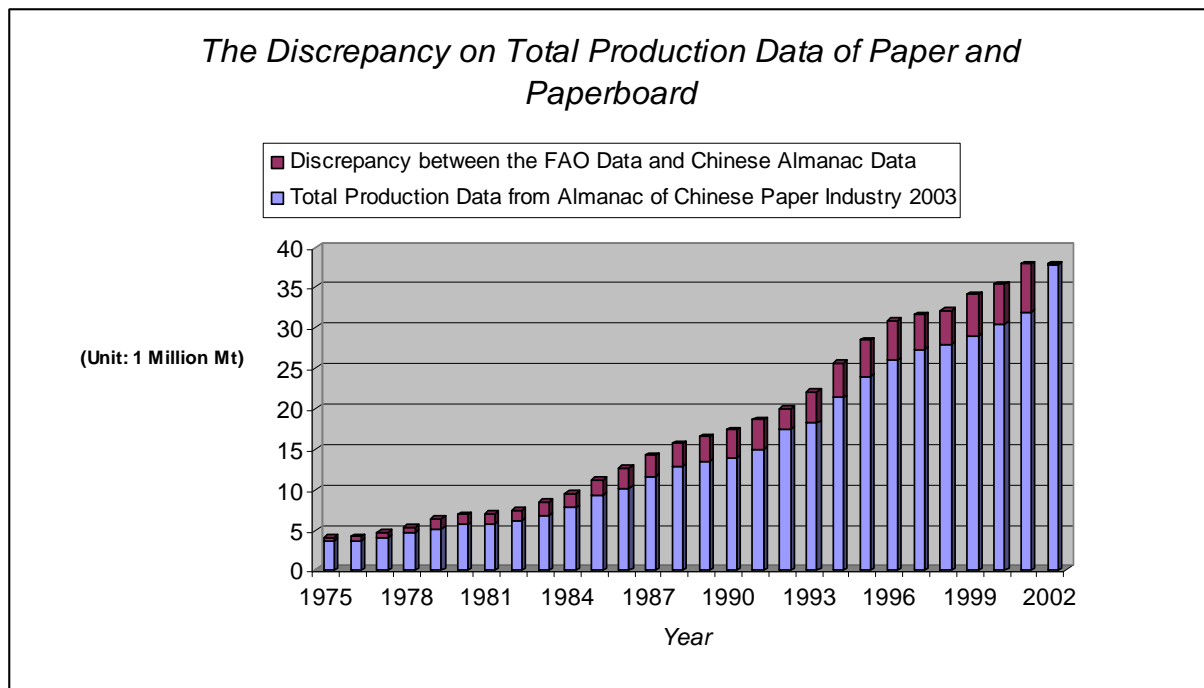
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 28



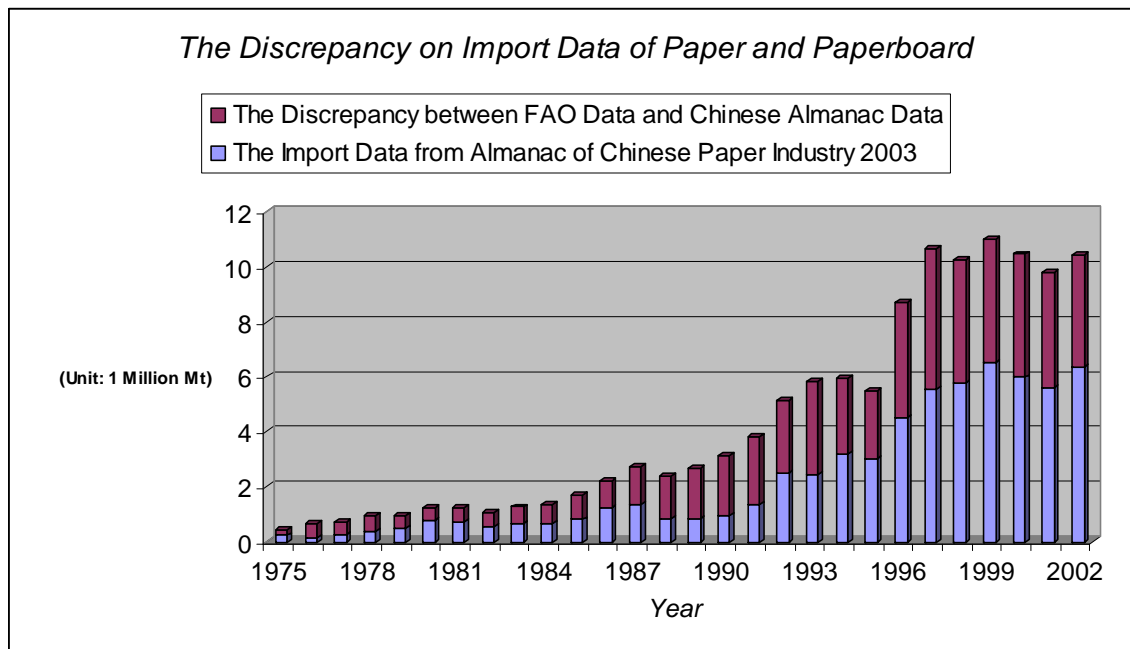
(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Graph 29



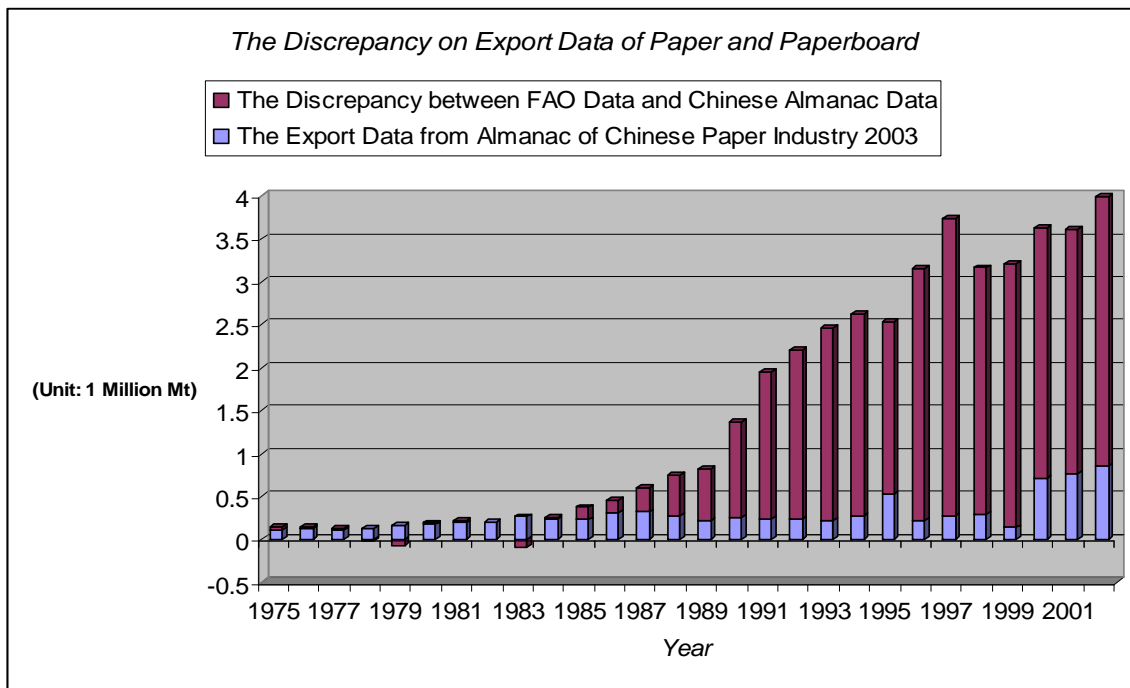
(Data Source: FAO and the Almanac of Chinese Paper Industry 2003)

Graph 30



(Data Source: FAO and the Almanac of Chinese Paper Industry 2003)

Graph 31



(Data Source: FAO and the Almanac of Chinese Paper Industry 2003)

Tables

Table 1

Pulp Used in Chinese Paper Production in 2001

(Unit: million Mts, %)

| | Quantity | Proportion (%) |
|------------------------------------|-----------------|-----------------------|
| Total Demand | 29.8 | 100.0 |
| 1. Total Demand for Wood Pulp: | 6.9 | 23.1 |
| Domestic Made Wood Pulp | 2 | 6.7 |
| Imported Wood Pulp | 4.9 | 16.4 |
| 2. Total Demand for Non-Wood Pulp: | 9.8 | 32.9 |
| Reed Pulp | 1.0 | 3.4 |
| Bamboo Pulp | 0.3 | 1.0 |
| Kraft Bagasse Pulp | 0.3 | 1.0 |
| Grass and Straw Pulp | 7.2 | 24.2 |
| Other Pulp | 1 | 3.4 |
| 3. Recycled Pulp: | 13.1 | 44.0 |
| Domestic Recycled Pulp | 8 | 26.9 |
| Imported Recycled Pulp | 5.1 | 17.1 |

(Data Source: Almanac of Chinese Paper Industry 2003)

Table 2

Different Types of Pulp Used in the Chinese Paper Production (2000-2005)

(Unit: million Mts, %)

| Categories | Production | | | | | | Proportion (%) | | | | | |
|------------------|------------|------|------|------|-------|-------|----------------|------|------|------|------|------|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Wood Pulp | 5.35 | 6.9 | 7.4 | 8.2 | 9.7 | 11.44 | 19.2 | 23.2 | 21.3 | 21.0 | 21.8 | 22.0 |
| Recycled Pulp | 11.4 | 13.1 | 16.2 | 19.2 | 23.05 | 28.08 | 40.9 | 43.9 | 46.7 | 49.1 | 51.7 | 54.0 |
| Other Fiber Pulp | 11.15 | 9.8 | 11.1 | 11.7 | 11.8 | 12.48 | 39.9 | 32.9 | 32.0 | 29.9 | 26.5 | 24.0 |
| Total | 27.9 | 29.8 | 34.7 | 39.1 | 44.55 | 52 | 100 | 100 | 100 | 100 | 100 | 100 |

(Data Source: Annual Report of Chinese Paper Industry 2001-2005)

Table 3
China: Import of Pulp, 2000-2005

(Unit: thousand Mts, %)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|------|------|------|------|------|
| Chem. wood pulp, soda or sulphate, bleached, coniferous | 1083 | 1772 | 1761 | 1964 | 2441 | 2894 |
| Chem. wood pulp, soda or sulphate, bleached, non-coniferous | 1285 | 1978 | 2042 | 2313 | 2964 | 2598 |
| Chem. wood pulp, soda or sulphate, unbleached | 249 | 420 | 671 | 662 | 626 | 766 |
| Semi-Chem. wood pulp | 255 | 196 | 358 | 644 | 751 | 868 |
| Total imported wood pulp | 3294 | 4873 | 5229 | 5989 | 7215 | 7520 |
| Total Export | 21.0 | 12.6 | 19.2 | 25.1 | 17.5 | 47 |
| Imported wood pulp / Total consumption of wood pulp (%) | 61.6 | 70.6 | 70.7 | 73.0 | 74.4 | 65.7 |

(Data Source: UN Comtrade Database: <http://comtrade.un.org/db>)

Table 4
China: Source of Imported Wood Pulp, 2000-2005

(Unit: thousand Mts)

| Source | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Canada | 872 | 1076 | 1172 | 1462 | 1838 | 2006 |
| Indonesia | 842 | 1031 | 1131 | 1186 | 1360 | 1367 |
| Russian Fed. | 581 | 868 | 910 | 889 | 926 | 970 |
| Chile | 247 | 629 | 543 | 487 | 667 | 778 |
| USA | 293 | 313 | 508 | 509 | 690 | 717 |

(Data Source: UN Comtrade Database)

Table 5

Source of Imported Waste Paper & Paperboard to China

(Unit: thousand Mts)

| Source | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| USA | 2598 | 4060 | 3978 | 5769 | 6233 | 7480 |
| Japan | 52 | 555 | 966 | 948 | 1915 | 3063 |
| United Kingdom | 5 | 94 | 167 | 362 | 802 | 1545 |
| Netherland | 139 | 343 | 254 | 385 | 781 | 1191 |

(Data Source: UN Comtrade Database)

Table 6

China: Production & Consumption of Paper & Paperboard

(Unit: million Mts)

| | 1990 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Total Production | 13.9 | 18.2 | 21.4 | 24 | 26 | 27.3 | 28 | 29 | 30.5 | 32 | 37.8 | 43 | 49.5 | 56 |
| Total Consumption | 14.6 | 20.4 | 24.3 | 26.5 | 30.3 | 32.6 | 33.5 | 35.2 | 35.7 | 36.8 | 43.3 | 48.1 | 54.4 | 59.3 |
| Gap | -0.7 | -2.2 | -2.9 | -2.5 | -4.3 | -5.3 | -5.5 | -6.2 | -5.2 | -4.8 | -5.5 | -5.1 | -4.9 | -3.3 |

(Data Source: Almanac of China Paper Industry 2002-2004, Annual Report of China Paper Industry 2001-2005)

Table 7

China : Source of Imported Paper & Paperboard

(Unit: thousand Mts)

| Country (Area) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| USA | 898 | 607 | 685 | 686 | 733 | 658 |
| South Korea | 1166 | 1073 | 895 | 854 | 849 | 601 |
| Japan | 469 | 457 | 476 | 432 | 468 | 413 |
| Indonesia | 755 | 495 | 652 | 561 | 478 | 375 |

(Data Source: UN Comtrade Database)

Table 8
China: Import of Paper & Paperboard

(Unit: thousand Mts)

| Item | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------------------------------|--------|--------|--------|--------|------|--------|
| Total | 5971 | 5587 | 6369 | 6357 | 6140 | 5240 |
| Newsprint | 211 | 154 | 199 | 351 | 120 | 157 |
| Uncoated Printing & Writing Paper | 239 | 244 | 365 | 394 | 470 | 419 |
| Coated Paper | 1092.4 | 994.4 | 1217.7 | 1010 | 1020 | 733.6 |
| Art Paper | — | 970.3 | 614.8 | 523.4 | 630 | — |
| Package Paper | — | 278 | 313.7 | 278.7 | 290 | 104.8 |
| Liner Board | — | 1264.8 | 1254.4 | 1171.8 | 1280 | 1362.4 |
| White Board | — | 977.8 | 814.8 | 1042.6 | 1080 | 890.8 |
| Coated Folding Board | — | 825.5 | 795.8 | 1029.2 | 1070 | — |
| Household Paper | 33.7 | 29.8 | 33.2 | 36.4 | 50 | 52.4 |
| Corrugated Paper | 1038.6 | 1178.7 | 1334.8 | 1349 | 1140 | 890.8 |
| Specialty Paper | — | 382.8 | 480.7 | 441 | 410 | 419.2 |

Data Source: Almanac of China Paper Industry 2002-2004, Annual Report of China Paper Industry 2001-2005 (data for 2005 are estimated based on percentages given in graphs.)

Table 9
Chinese Import Tariffs

(Unit: %)

| Grade | Pre-WTO Tariff | Jan. 1 2002 Upon WTO's Accession | 2002 | 2003 | 2004 | 2005 | 2006 |
|--|-------------------|-------------------------------------|------|------|------|------|------|
| Newsprint | Sliding scale | 12.0 | 11.0 | 8.5 | 8.5 | 7.5 | 5.0 |
| Printing & Writing Paper(Uncoated &Light Weight) | — | 9.0 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| Printing & Writing Paper(Uncoated &Heavy Weight) | — | 8.5 | 6.8 | 5.0 | 5.0 | 5.0 | 5.0 |
| Household & Sanitary Paper | — | 11.3 | 9.4 | 7.5 | 7.5 | 7.5 | 7.5 |

(Data Source: <http://fuwutong.asiaec.com/fuwuzixun/bzys/fgbz/345746.html>)

Table 10
Expansion of Capacity

(Unit: Mts/Yr)

| Company Name | Description of the Machine | Capacity | Start-up Time |
|---|---|----------|---------------|
| Shanghai Norske Skog Potential Paper Co. (Shanghai) | New machine with 4800mm untrimmed width | 120,000 | Feb, 1998 |
| Longyan Paper Co. (Fujian) | Second-hand machine with 5660mm untrimmed width | 70,000 | Jan, 1999 |
| Yueyang Paper Co. (Hunan) | Rebuilt | 60,000 | 1999 |
| Nanping Paper Co. (Fujian) | New machine with 5540mm untrimmed width | 180,000 | Dec, 1999 |
| Guangzhou Paper Co. (Guangdong) | Second-hand machine with 8300mm untrimmed width | 130,000 | Jun, 2000 |
| Qiqihaer Paper Co. (Heilongjiang) | New machine with 5560mm untrimmed width | 180,000 | Apr. 2001 |
| Jilin Paper Co. (Jilin) | Rebuilt | 180,000 | Apr. 2001 |
| Huatai Paper Co. (Shandong) | Second-hand machine with 6060mm untrimmed width | 180,000 | Aug. 2001 |
| Wuhan Chenming Paper Co. (Wuhan) | New machine with 4800mm untrimmed width | 150,000 | Jan. 2002 |
| Shiyan Paper Co. (Jilin) | Second-hand machine with 6300mm untrimmed width | 180,000 | Sep. 2002 |
| Yalujian Paper Co. (Jilin) | Rebuilt (2 machines) | 70,000 | 2002 |

(Data Source: Almanac of Chinese Paper Industry 2003 and CIF Consulting Ltd.)

Table 11
Newsprint Capacity

(Unit: thousand Mts/Yr)

| Company Name | Capacity for Newsprint |
|--|------------------------|
| Nanzhi Paper Co., Fujian | 300 |
| Guangzhou Paper Co., Ltd. | 260 |
| Heilong Paper Co., Ltd, Heilongjiang | 250 |
| Shiyuan Bailu Paper Co., Ltd. Jilin | 230 |
| Huatai Paper Co., Ltd. Shandong | 160 |
| Chenming Paper Co., Ltd. Wuhan | 150 |
| Shanghai Norske Skog Potential Paper Co., Ltd. | 135 |
| Jiangxi Paper Co., Ltd | 102 |
| Jilin Paper Co., Ltd. | 100 |
| Yueyang Paper Co., Ltd | 80 |
| Longyan Paper Co., Ltd. Fujian | 80 |
| Yibin Paper Co., Ltd. | 70 |
| Yalujiang Paper Co., Ltd. Jilin | 60 |
| Jinjiang Paper Co., Ltd. Zhejiang | 51 |
| Jingdaxing Paper Co., Ltd. Guangxi | 120 |
| Liuzhou Zhongzhu Co., Ltd. | 50 |
| Tianyuan Paper Co., Ltd., Shandong | 50 |
| Guihe Paper Co., Ltd., Shandong | 20 |
| Tengzhou Chunlei Paper Co.,Ltd., Shangdong | 30 |
| Zhucheng new star Paper Co., Ltd., Shandong | 30 |
| Lanxi Hualun Paper Co., Ltd. Zhejiang | 15 |
| Xian Huamei Paper Co., Ltd. | 20 |

(Data Source: Almanac of Chinese Paper Industry 2003)

Table 12

Prediction of Capacity in 2020

(Unit: million Mts, billion USD)

| Categories | Predicted New Capacity | Investment |
|--|-------------------------------|-------------------|
| Chemical Wood Pulp | 23.15 | 30 |
| Forest(providing the raw material for Wood Pulp) | 3.15 (million hectare) | 2.4 |
| Newsprint | 2.36 | 2.36 |
| Printing and Writing Paper | 6.49 | 5.25 |
| Art Paper | 1.82 | 2.73 |
| Light Weight Coated Paper | 5.4 | 6.48 |
| Household & Sanitary Paper | 6.93 | 9.01 |
| Wrapping & Packing Paper | 5.61 | 4.48 |
| Linear Kraft Board | 13.95 | 5.58 |
| Coated White Board | 8.39 | 5.87 |
| Corrugated Medium | 6.7 | 2.68 |
| Total | | 76.84 |

(Data Source: Almanac of Chinese Paper Industry 2003)

Table 13

Variable Definition for publicly listed pulp and paper companies

| Variable | Definition |
|-----------------------------------|--|
| Main Products | Pulp & paper |
| Revenue from Main Products | Sales of pulp & paper products |
| Growth Rate | $(\text{Year2}-\text{Year1}) / \text{Year1}$ |
| Profit Rate | Profit of main products/Income of main products |
| Proportion of Loss-making company | Loss-making listed enterprises/Total listed enterprises in pulp & paper industry |
| Average Yearly Wage | Total wage bill / number of workers |
| Labor Cost | Wage of workers |
| Total Cost | Cost of main products |
| Share of Labor Cost | Labor cost/Total cost |

(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Table 14
Descriptive Statistics

| Description | Minimum | Maximum | Means | Variance |
|---|----------------|----------------|--------------|-----------------|
| Growth Rate of Revenue from Main Products | 0.12 | 1.02 | 0.36 | 0.08 |
| Profit Rate of Main Products | 0.19 | 0.23 | 0.21 | 0.00 |
| Number of Listed Enterprises | 12 | 25 | 19.25 | 21.44 |
| Rate of Loss-making Listed Enterprises in Pulp & Paper Industry | 0.00 | 0.20 | 0.08 | 0.00 |
| Average Yearly Wages | 8145.69 | 24417.95 | 15416.94 | 25569932.47 |
| Growth Rate of Average Yearly Wages | 0.09 | 0.42 | 0.21 | 0.01 |
| Rate of Labor Cost | 0.07 | 0.09 | 0.08 | 0.00 |
| Total Revenue from Main Products / Worker | 152587.99 | 439078.25 | 266273.70 | 8642590896.00 |
| Total Profit from Main Products / Worker | 31892.29 | 82170.91 | 55847.07 | 265729659.90 |
| Inventory / Total Revenue from Main Products | 0.19 | 0.28 | 0.22 | 0.00 |

(Data Source: Annual reports of listed paper and pulp companies 1998 - 2005, collected by Shenzhen GTA Information Technology Co Limited)

Picture 1 Reeds used in RIYIN



Picture 2 Facility in Riyin



Picture 3 Paper Machine in Riyin

