EPI BRIEFING PAPER

ECONOMIC POLICY INSTITUTE • JUNE 2010 • BRIEFING PAPER #264

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Subsidies to China's Paper Industry From 2002-09

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Executive summary

- Since 2000, China has tripled its paper production. In 2008, China overtook the United States to become the world's largest producer of paper and paper products. In 2009, China produced over 17% of the world's total output and consolidated its place as one of the world's largest exporters in this industry.
- China's rapid rise in the global paper industry has been fueled by over $33.1 billion in government subsidies from 2002 to 2009.
- China's paper industry has limited economies of scale or scope. Over 88% of the companies are small and 12% are medium-sized. The top 10 companies in China control about 20% of the total domestic market with the balance spread across a range of small, inefficient companies. The industry is geographically fragmented as well, operating in 30 provinces.
- China has no natural competitive advantage in papermaking, and lacks the natural resources to fuel the industry. China's forest base is among the smallest in the world per capita. Consequently, the country is the largest importer in the world of pulp and recycled paper. Despite global overcapacity, China's paper industry has added on average 26% of new capacity every year from 2004. With saturated domestic markets, proportionately much smaller per capita than those

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in developed countries, exports have led the development of China's paper industry with detrimental effects on the United States and global economies.

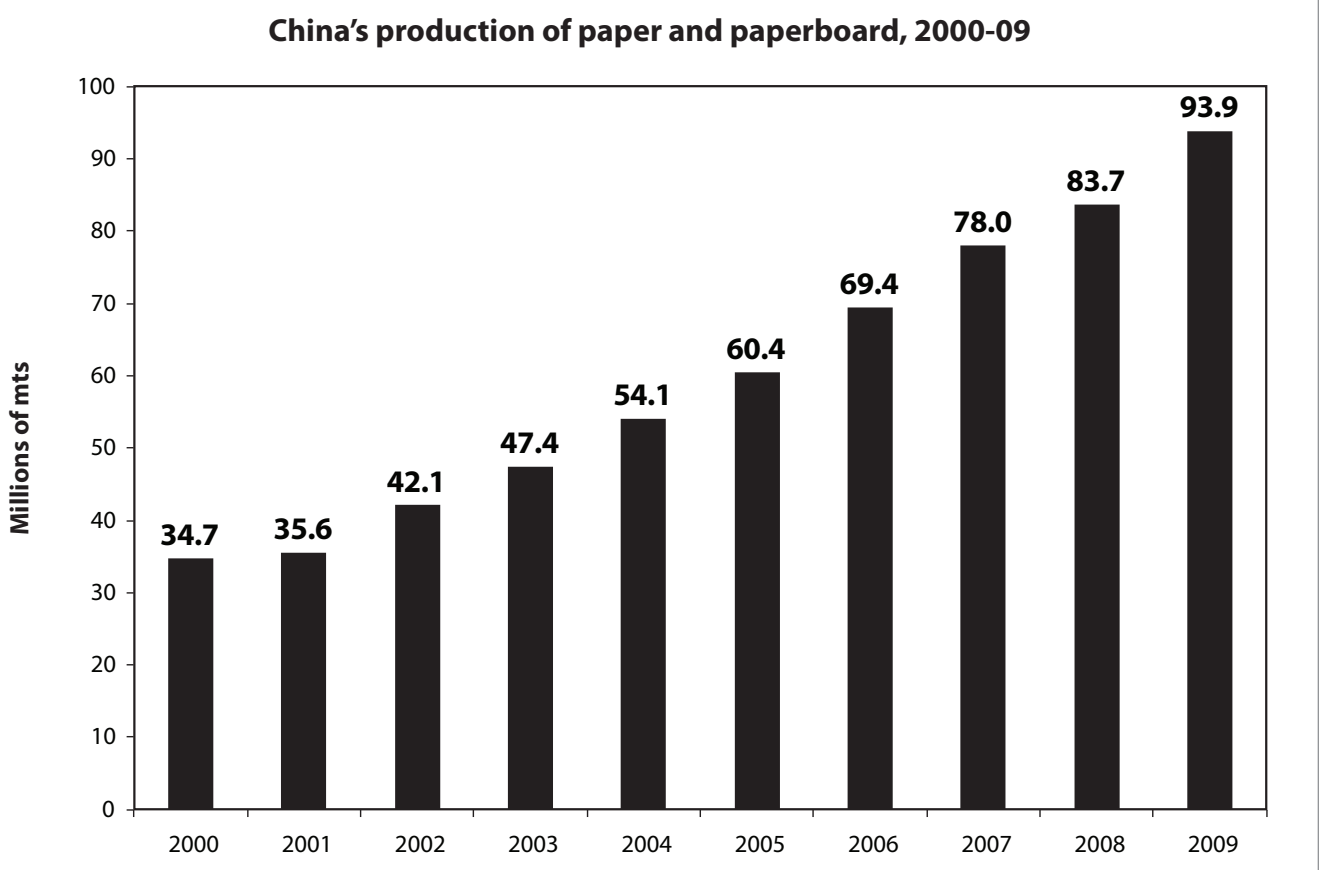
- The U.S. trade deficit with China on paper has been increasing exponentially since 2002. Imports from China are rising faster than those from any other country for this industry. In February 2010, the annualized growth rate of Chinese paper and paper-product imports into the United States approximated 22%.
- China has no inherent cost advantages in the capital-intensive paper industry. Indeed, labor makes up about 4% of the costs in this industry; in contrast, imported recycled paper and pulp comprise over 35% of the costs. Raw materials, which make up three-fourths of the costs of producing Chinese paper, as well as electricity, coal, and transportation, have nearly doubled in price over the last decade. Yet, Chinese paper sells at a substantial discount compared to U.S. or European paper.
- The government's policies on forestry assume high importance for the Chinese paper industry as the government allocates resources for plantation development and trade. Policies have systematically aimed to reduce China's dependence on imported raw materials and to subsidize the paper industry's restructuring. Central and local governments' subsidies and soft loans also protect debt-ridden, state-owned enterprises (SOEs) and small, local companies with excess-production capacity.
- This Briefing Paper estimates that in China's paper industry, subsidies for electricity amounted to $778 million (from 2002 to 2009); subsidies for coal, $3 billion (from 2002 to 2009); subsidies for pulp $25 billion (from 2004 to 2009); subsidies for recycled paper, $1.7 billion (from 2004 to 2008); subsidy income reported by companies, $442 million (from 2002 to 2009); and loan-interest subsidies, $2 billion (from 2002 to 2009). Missing data prevented calculation of pulp or recycled-paper subsidies in 2002, 2003, and 2009.

Introduction

In 2008, China overtook the United States to become the world's largest producer of paper and paper products. In 2008, China had been poised to become a net exporter of paper and paper products; but, the fall in global demand led to greater than expected inventories for Chinese producers. In November 2008, the National Bureau of Statistics (2003-09b), China reported that the industry's output had increased to 83.9 million metric tons, up 9.6% from the previous year. In 2009, China produced over 17% of the world's total output in the paper industry; with exports of $7.6 billion in paper and paperboard, China consolidated its position as a lead exporter in the industry.[1] As **Figure A** shows, since 2000, China has increased paper production three-fold to assume a leading role in the global paper industry. Yet China has no competitive advantage in this capital-intensive industry and lacks the natural resources to fuel it. With saturated domestic markets, proportionately much smaller per capita than in developed countries, exports have served, and are expected to continue to serve, as the primary engine of growth for China's paper industry, adversely affecting the U.S. and global economies.

In 2010, China has by far the fastest-growing paper industry in the world. Yet, China also has among the smallest forestry resources in the world to support this industry's expansion. Consequently, it imports the bulk of its raw materials at world prices—yet, paper in China generally sells at prices much lower than in the United States or European Union. Globally, and in China, labor constitutes a very small part of the costs of the paper industry—high capital investments play a major role. In China, government subsidies and loans have provided strong support for the paper industry's expansion. Combined with saturated, domestic product markets, the expansion has lead to enormous overcapacity in China and a meteoric increase in China's paper exports.

FIGURE A



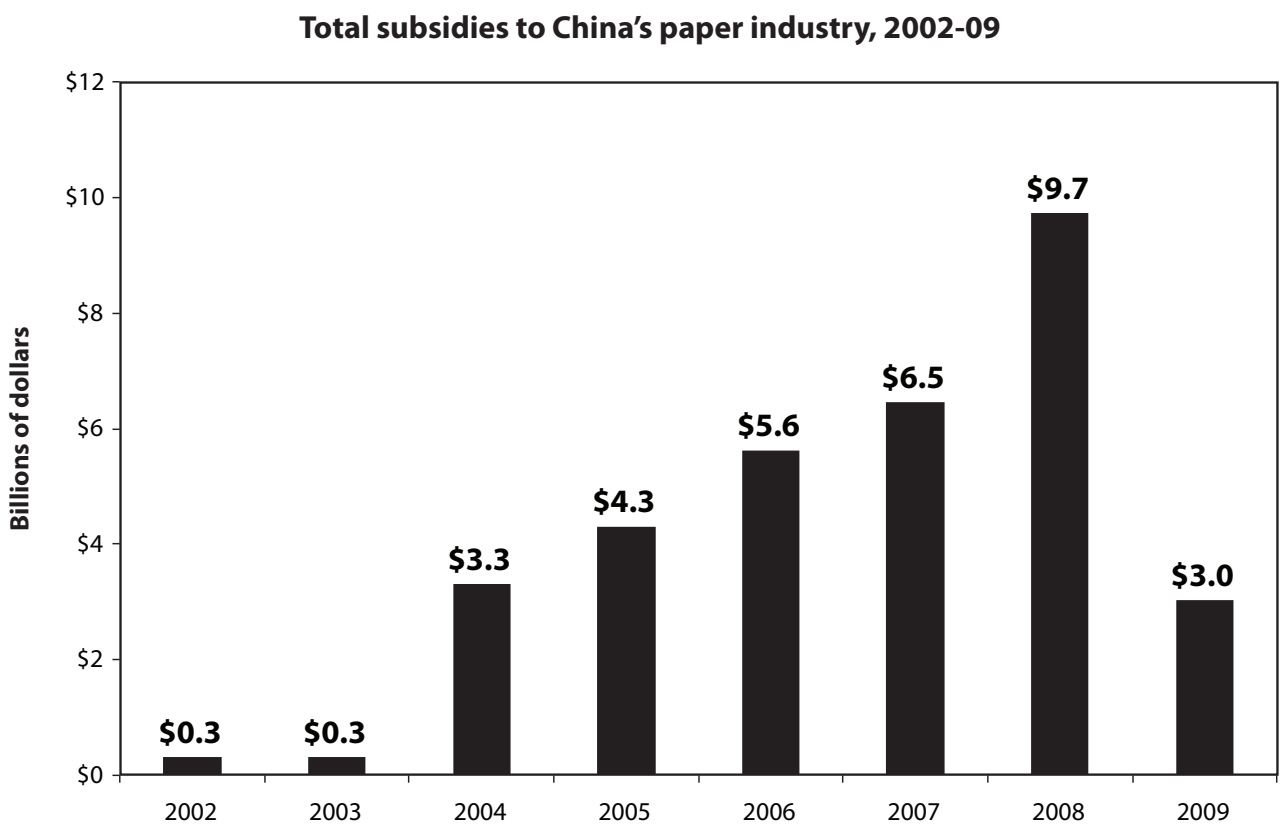
SOURCE: FAO and China Paper Online.

This Briefing Paper tracks the remarkable transformation of the Chinese paper industry from 2002 to the present through focused government policy, massive capacity expansion, export-led development, and over $33.1 billion in government subsidies. **Figure B** summarizes some subsidies to the Chinese paper industry from 2002 to 2009 covering electricity, coal, pulp, recycled paper, subsidies reported in companies' annual reports, and interest-free loans. As described later, because of extensive missing data, subsidies to pulp could only be calculated from 2004 to 2009, and subsidies to recycled paper from 2004 to 2008. Subsidies for some inputs fell dramatically in 2009 as reported below: world commodity prices plummeted in the recession; price differentials between Chinese and world prices fell resulting in a decline in the corresponding subsidies.

Characteristics of China's paper industry

Since 2002, the number of paper companies in China has steadily increased. In 2007, China had 8,376 companies manufacturing paper and paper products. By November 2008, the number of companies in this industry grew to 8,731 (National Bureau of Statistics, China, 2008b). On average, the extremely fragmented Chinese paper industry shows no economies of scope or scale,[2] has shown poor profitability, and has no technological advantages. However, as later sections will elaborate, the central government has proposed and implemented various policies, with varying degrees of success, to consolidate the paper industry in China. These policies have aimed to fuse the interlinked forest-pulp-paper sectors, siphon huge investments into new, large, state-of-the-art paper mills, and shut down old, inefficient and small mills.

FIGURE B



SOURCE: China National Development and Reform Commission, China National Bureau of Statistics, Steelonthenet, International Energy Agency, Food and Agricultural Organization, Morgan Stanley, China Market Pulp Report, China Recovered Paper Report, CEIC, Macquarie Research, Deutsche Bank, Chinese companies' annual reports, American Forest & Pulp Association, Australian Bureau of Agricultural and Research Economics, author's calculations.

Sectors

The Chinese paper industry displays no economies of scope through distributional or marketing efficiencies or strategies such as product bundling. Companies manufacture and sell a range of seemingly unrelated products spanning various sectors including machine-made paper and paperboard, paper and paper containers, converted paper, pulp, hand-made paper, and other paper products.

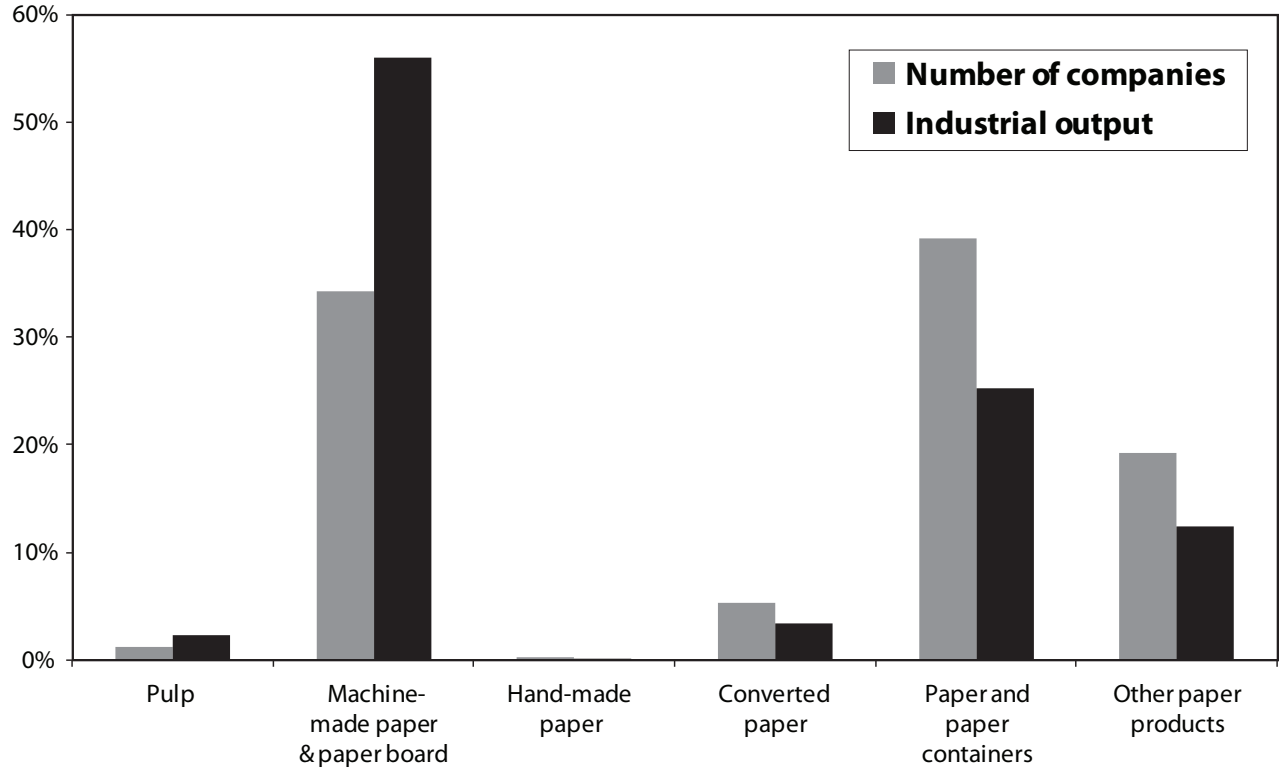
Most of the companies focus on manufacturing low-quality products. As **Figure C** shows, machine-made paper and paperboard accounted for 56% of industrial output. This sector has also served as a focus for more efficient production in the industry. Unchanged from 2007, companies manufacturing machine-made paper and paperboard had the highest-valued assets in this industry of RMB450 billion[3] ($65.6 billion) or 64% of the entire industry. Paper containers comprised 26.3% of the industry's asset value, pulp 6.5%, and hand-made paper and converted paper comprised 2.8% each. However, new capital investments have been flowing into paper and paper containers and other paper products, which in 2008 experienced growth rates of 4.0% and 13.8%, respectively.

Fragmentation

China's paper industry generally has no scale economies and the industry is highly fragmented. Globally, the top 15 companies in paper have about one-third of the world market of 400 million metric tons. Conversely, the Chinese paper

FIGURE C

Companies and output by product in China's paper industry, 2008



SOURCE: China National Bureau of Statistics.

industry has very few large companies and thousands of smaller companies operating nationwide. About 88% of all companies in China's paper industry are small, while 12% are medium-sized. The top 10 companies in China control about 20% of the total domestic market with the balance spread across a range of small, inefficient companies.

Since 1996, Beijing has been increasing its investments in "New China" paper mills of greater than 50,000 tons per year, with large, fast and efficient machines, which currently use mostly imported pulp and paper (see Flynn 2006). The largest Chinese paper company of this ilk, Nine Dragons, has not yet emerged as a top 15 global player. However, in 2007, Nine Dragons announced that it plans to double its production capacity of 5.4 million tons with a $1 billion investment over two years. If this announced capacity expansion takes place, Nine Dragons should become one of the five largest paper companies in the world in 2010.

The Chinese paper industry shows geographic fragmentation as well. As **Table 1** shows, paper companies operate in 30 of China's 31 provinces. Shandong, Zhejiang, Guangdong, Jiangsu, and Henan produce between 8% and 20% of China's paper and paper products. Fujian, Hebei, Shanghai, Hunan, and Sichuan produce about 2% to 5% each, and every other Chinese province produces less than 2% of China's paper output.

Performance

In November 2007, 635 paper companies (7.6% of the total) in China reported losing money with total losses of RMB2.2 billion ($295 million). In November 2008, the number of companies reporting losses increased to 1,577 (18.1% of the total), with total losses of RMB3.7 billion ($542 million). **Table 2** shows that losses seeped through all

TABLE 1

Paper manufacturers in China by region, 2007

Region	Number of enterprises	Gross industrial output value (millions of RMB)	Number of employees (thousands)	Share
National	8,376	632,545.1	1,383.0	100%
Beijing	120	6,503.8	11.4	1.0
Tianjin	174	5,149.5	14.9	0.8
Hebei	284	22,121.2	56.6	3.5
Shanxi	26	1,073.3	6.1	0.2
Inner Mongolia	32	2,956.7	10.3	0.5
Liaoning	293	11,292.6	32.8	1.8
Jilin	63	4,146.3	12.7	0.7
Heilongjiang	67	3,976.5	19.2	0.6
Shanghai	335	18,762.4	36.9	3.0
Jiangsu	637	75,677.9	105.4	12.0
Zhejiang	1,390	71,894.2	151.0	11.4
Anhui	167	7,735.1	24.0	1.2
Fujian	558	29,141.0	80.1	4.6
Jiangxi	127	8,214.9	17.9	1.3
Shandong	886	134,541.6	211.6	21.3
Henan	387	53,405.6	96.6	8.4
Hubei	214	11,470.9	29.9	1.8
Hunan	307	19,277.2	49.4	3.0
Guangdong	1,468	99,860.0	249.6	15.8
Guangxi	161	8,380.6	32.4	1.3
Hainan	14	6,479.2	4.5	1.0
Chongqing	90	3,203.0	9.9	0.5
Sichuan	306	14,429.3	51.1	2.3
Guizhou	34	610.0	2.9	0.1
Yunnan	81	3,735.8	14.5	0.6
Shaanxi	75	3,720.3	23.0	0.6
Gansu	27	862.5	6.4	0.1
Qinghai	3	7.2	0.1	0.0
Ningxia	16	2,376.0	14.8	0.4
Xinjiang	34	1,540.6	7.2	0.2

SOURCE: China National Bureau of Statistics.

TABLE 2

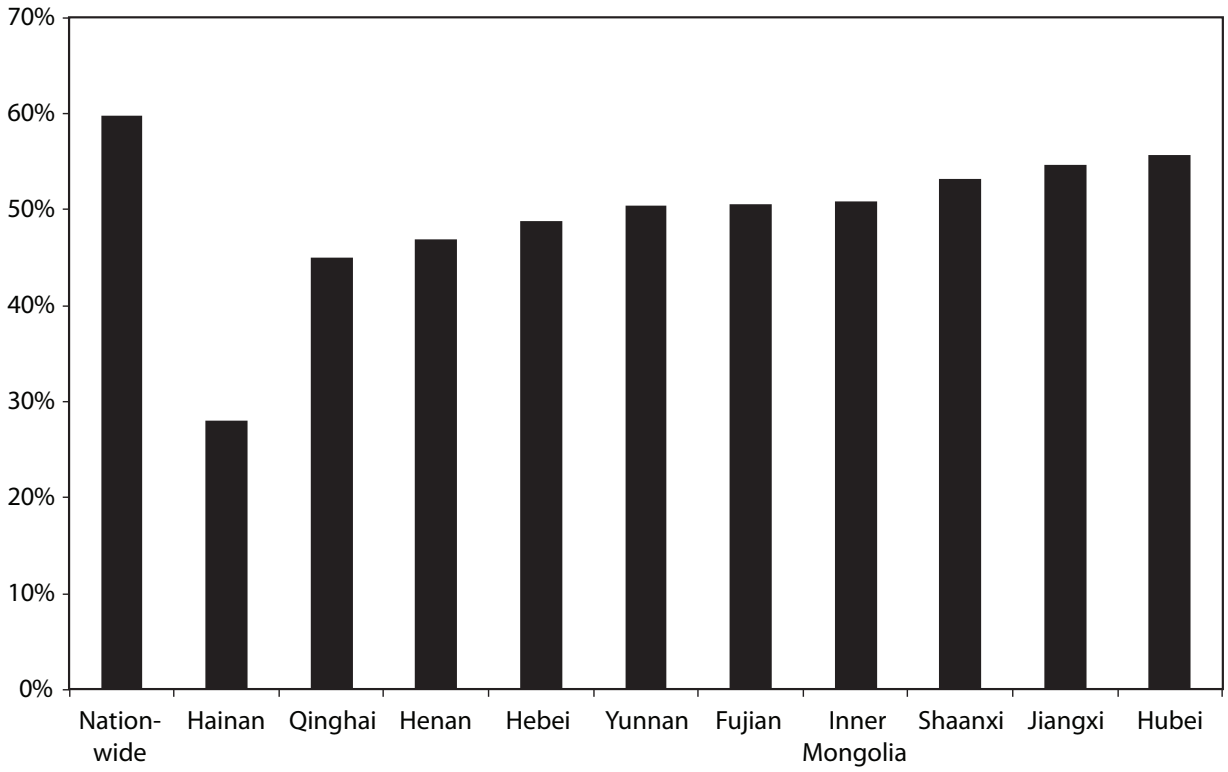
Losses of China's paper-making manufacturers, January-November 2008

Industry	Number of companies	Number of loss-making companies	Losses (RMB 100 million)
Total paper and paper products	8,731	1,577	37.0
Pulp	116	28	4.4
Machine-made paper and paperboard	3,006	581	18.0
Hand-made paper	29	8	3.8
Converted paper	467	91	1.9
Paper and paper container	3,432	584	6.8
Others	1,681	285	5.5

SOURCE: CBI China.

FIGURE D

Liability/asset ratios of paper manufacturers in largest paper-producing provinces, January-November 2007



SOURCE: China National Bureau of Statistics.

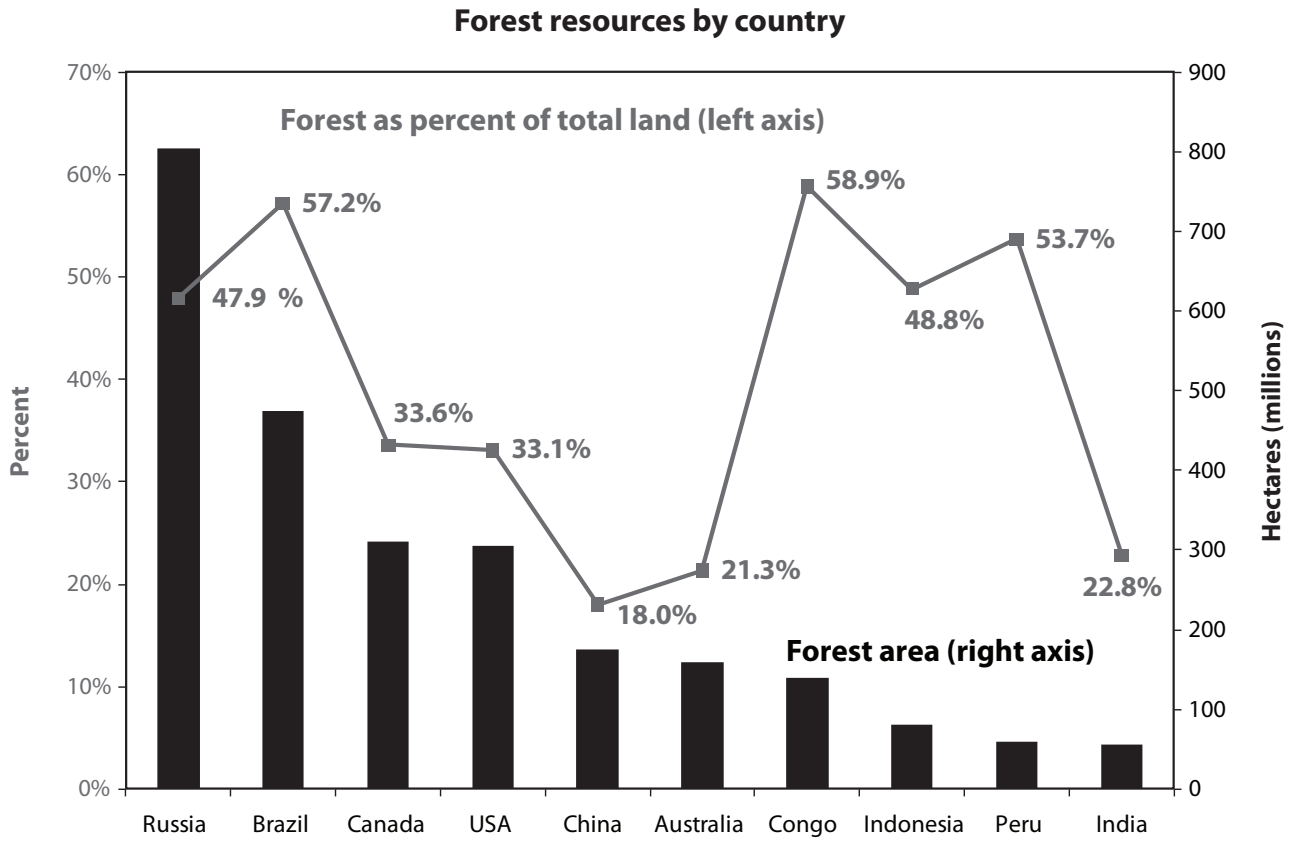
sectors of China's paper industry. The handful of backward-integrated companies have some pricing power in this industry and display less vulnerability to margin squeezes by controlling raw-material supplies. For example, Meili owns its plantations, grows its trees, and can pace pulp production. However, the Chinese containerboard producers, including the very large Nine Dragons and Lee & Man, do not have integrated raw-material supplies and are more exposed to falling prices for their products.

China's paper industry also has liability/asset ratios of about 60% nationally, indicating possible difficulties in collecting accounts receivable. **Figure D** shows that the average paper company in China's top paper-producing provinces had higher ability to pay debt than the national average for the industry. In November 2008, the paper industry's liabilities had mounted to RMB413.9 billion ($60.6 billion), up by 15.9% year-on-year. However, the liability/asset ratio of the industry remained at 59.3%, flat from 2007.

Technology

Despite the New China paper mills that employ state-of-the-art technology and new machines, China's paper industry generally uses outdated, obsolete, and polluting machinery and technology. Consequently, it has evolved into a major source of China's industrial pollution. Papermaking using straw pulp currently contributes most heavily to industrial pollution. In straw-pulp paper production, alkali is recovered from less than 30% of output. Between 60% and 80% of total pollution load (chemical oxygen demand, or COD) comes from black liquor (BL), a straw-pulp discharge and major water pollutant.[4]

FIGURE E



SOURCE: Deutsche Bank, author's calculations.

Smokestack manufacturing facilities in the paper industry also consume large amounts of water, coal, electricity, and raw materials per ton of paper produced. For example, an average paper mill in the United States or Europe consumes 0.9-1.2 tons of coal/ton of pulp, and about 35-50 tons of water. Conversely, in China, the average mill consumes 1.4 tons of coal/ton of pulp, and about 103 tons of water. Only a few companies reach advanced industrial standards.

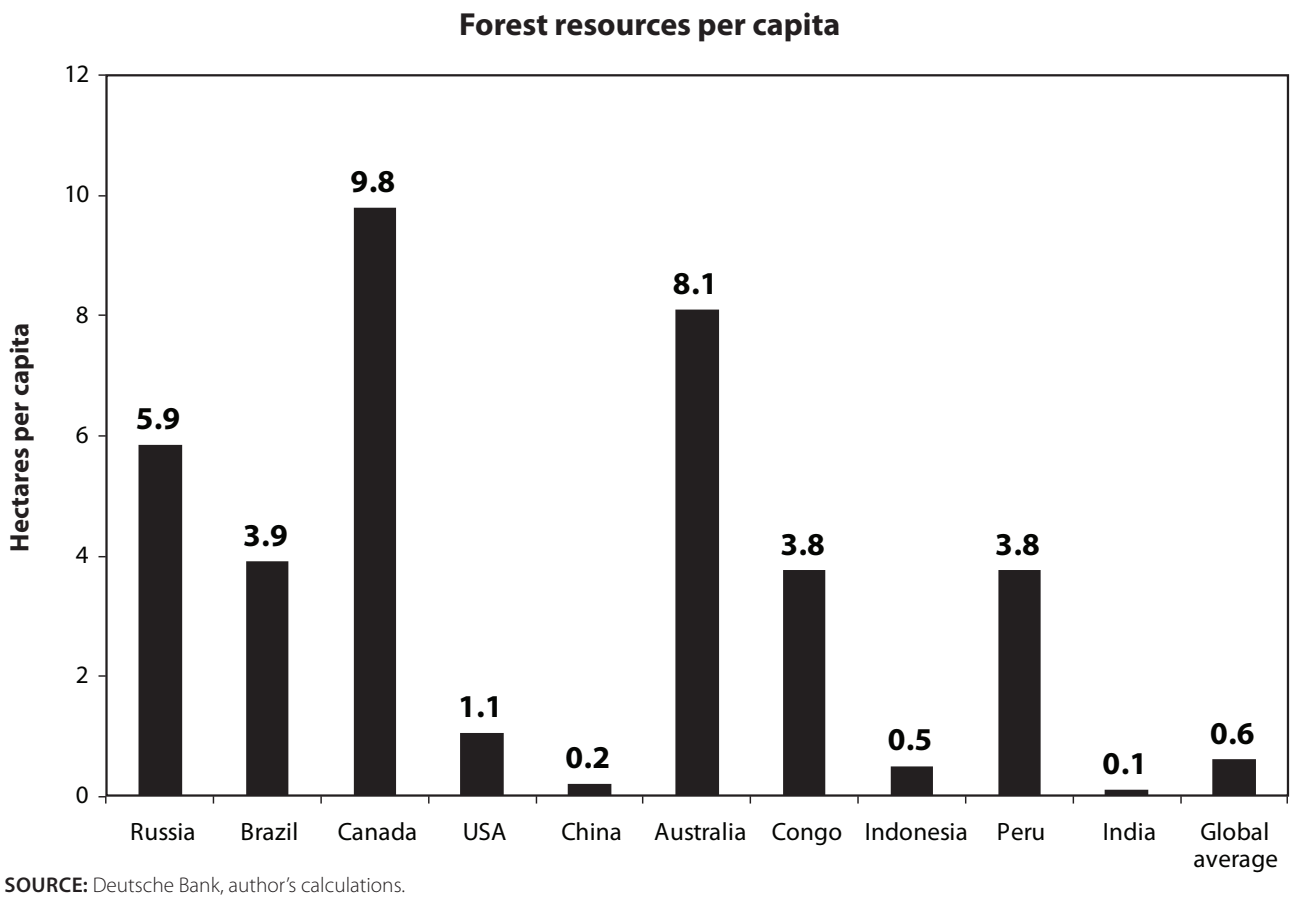
Natural resources, demand, and excess capacity in China's paper industry

In 2010, China has the fastest-growing paper industry in the world. But, China also has among the smallest forestry resources as a percent of land to support this industry's expansion—lower even than India, which has also experienced excessive deforestation. Consequently, China imports the bulk of its raw materials for paper production. Domestic demand only captures a very small part of the Chinese paper industry's expansion. Yet, the Chinese paper industry continues to expand, contributing to global excess capacity.

Supply of natural resources

China has no competitive advantages in the manufacturing of paper and paper products. As **Figure E** shows, with 175 million hectares, China ranks fifth in the world in terms of total forest reserves. In contrast, the United States, with almost twice the total forest reserves of China, ranks fourth. Additionally, on both forests per capita (see **Figure F**) and forest coverage as a percentage of land, China falls 40% below the global average (18% vs. 30.3%). Furthermore, surging

FIGURE F



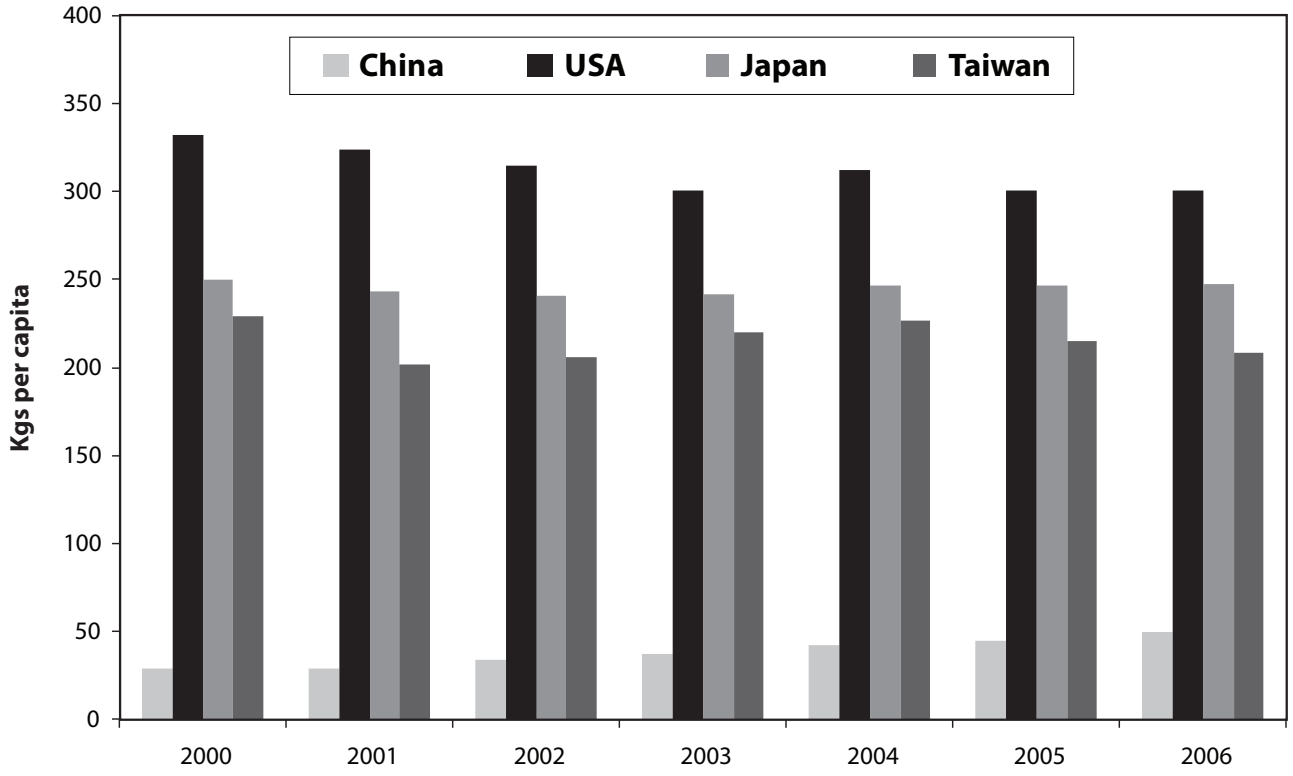
SOURCE: Deutsche Bank, author's calculations.

domestic as well as international demand for wood products has made China the largest forest-product importer in the world (as opposed to number seven 10 years ago).

Of China's forest area, plantations comprise about 30% or 50 million hectares. Of those plantations, 10% (or 3% of total forests) include fast-growing forests for pulp and paper. Five provinces—Tibet, Heilongjiang, Sichuan, Yunnan, and Inner Mongolia—together account for 62% of China's total forests. Since most of these provinces are located deep inland, transportation becomes a key cost. For some companies, transportation costs loom twice as high as log costs.[5] The government has announced plans to have 60 million hectares of plantations by 2010. These plantations cover coastal and inland areas in China, with plantations of more than 1 billion cubic meters lying inland to the north and south. The government also provides greater subsidies for reforestation of the desert lands found to the north and south.

FIGURE G

Per capita consumption of paper and paperboard by country, 2000-06



SOURCE: ChinaPaperOnline.

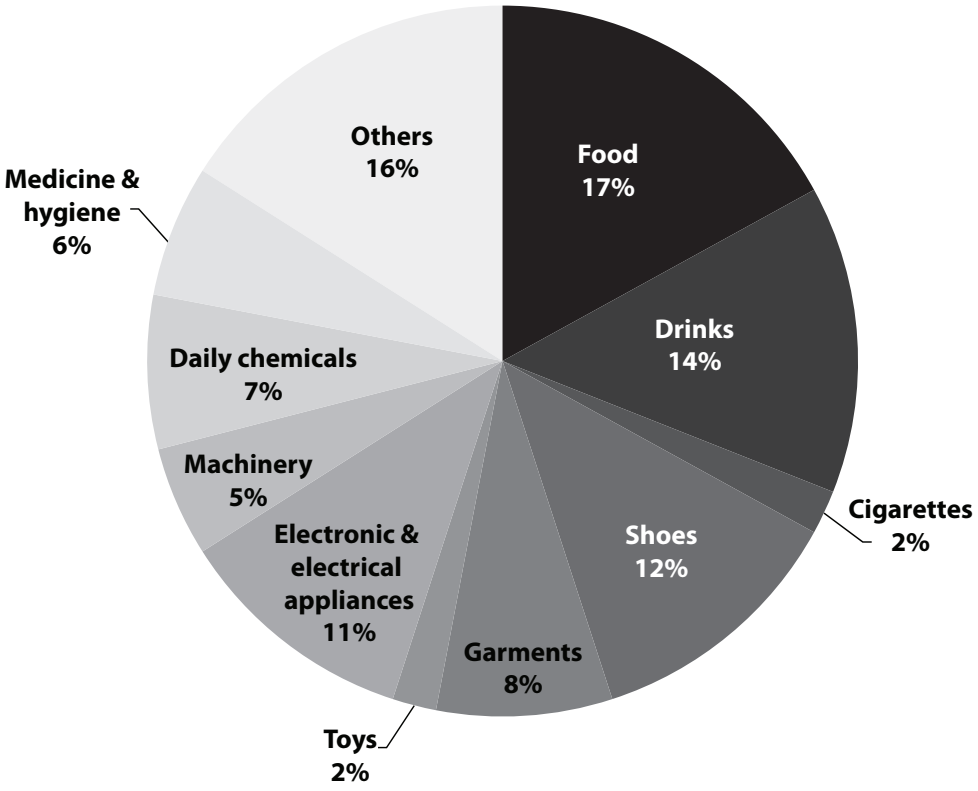
Demand for paper

RISI, Inc. projects that China's overall paper demand will grow from approximately 60 million tons in 2005 to 143 million tons in 2021, overtaking th e United States and Europe in 2013. However, the Chinese domestic market per capita for paper and paperboard is very small compared to any industrialized country. As **Figure G** shows, per-capita consumption of paper and paperboard in China is about one-sixth that of the United States. The Chinese domestic

market has experienced substantial growth for some products: for example, in 2007, the year-on-year growth in demand for coated, white paperboard was approximately 20%. Yet, domestic demand tends to be concentrated in lower-grade materials and products. Additionally, several segmented Chinese markets are suffering from saturated or excess supply. Domestic consumption of paper has increased by about 40% over the last decade. However, the bulk of the growth in domestic demand has occurred downstream and in industrial markets also associated with China's other exports.

FIGURE H

Domestic downstream demand for Chinese paper, 2008

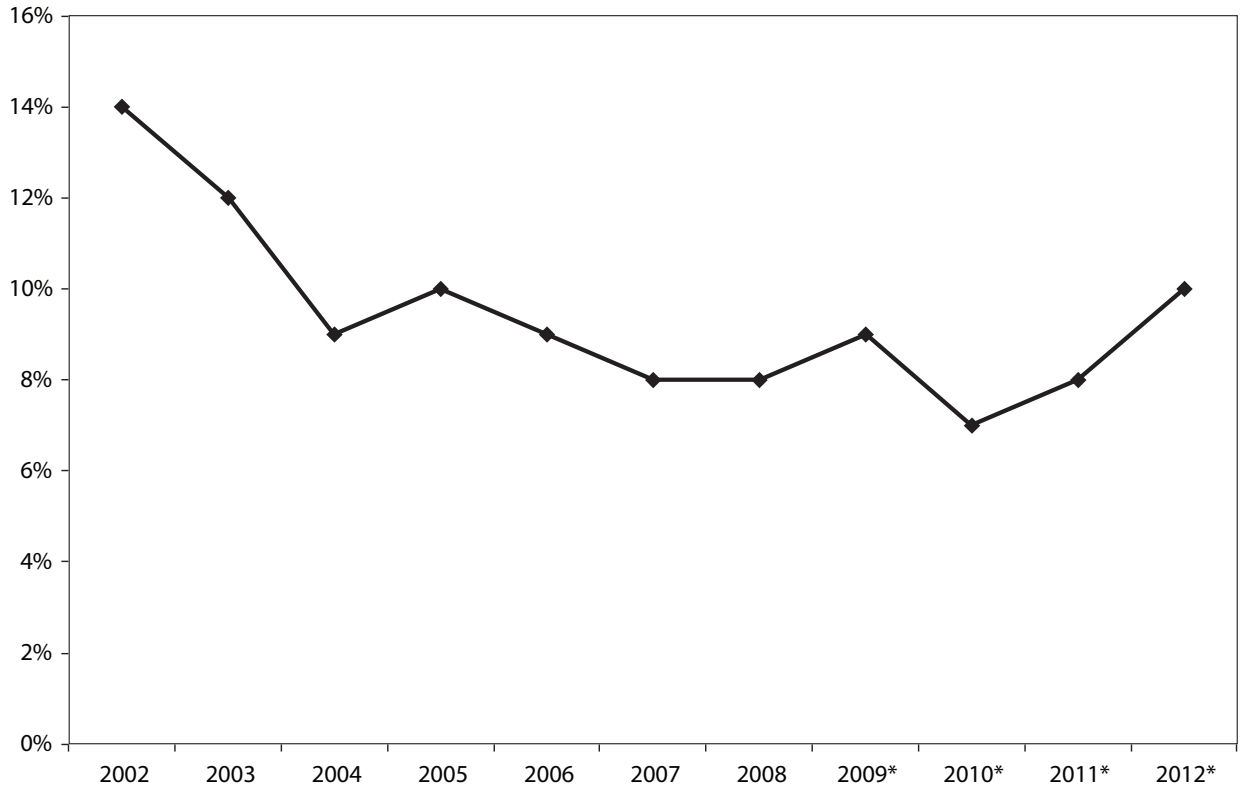


SOURCE: Papease.

Paper for industrial use explains about 60% of domestic demand for paper. As manufacturing in China grew, so did the demand for paper. **Figure H** highlights domestic downstream demand for Chinese paper. Light industry constitutes the largest consumer for industrial use. Consequently, light industry both complements the development of paper for industrial use and also impacts the structure of China's paper industry.

FIGURE I

Excess capacity in the global paper industry, 2002-12



* Estimated.

SOURCE: RISI, Macquarie Research.

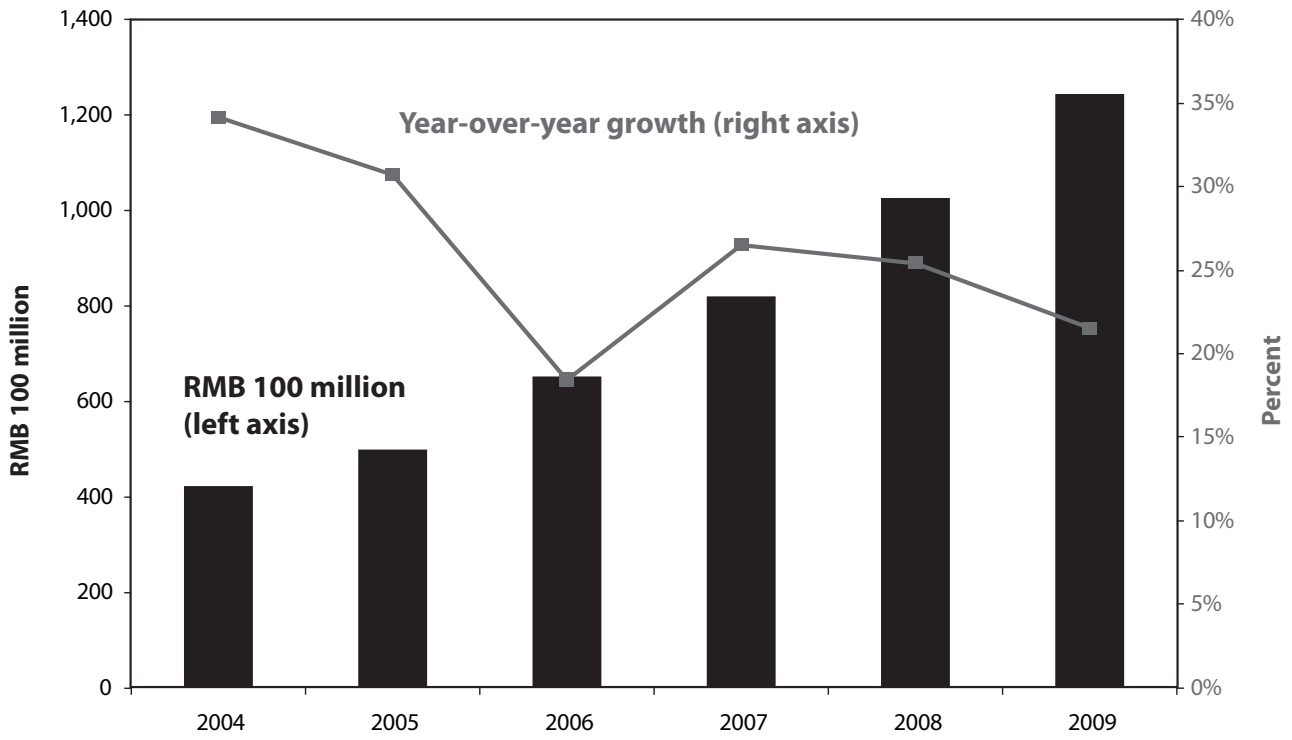
Excess capacity

The global market for paper and paper products is being oversupplied. The majority of this oversupply has been to European and U.S. markets, with Asia following closely. **Figure I** shows excess capacity in the global paper industry.[6] Excess capacity remained relatively flat from 2004-10, but is projected to grow sharply in the future.

Capacity expansion in the U.S. and European paper industries has been falling. Yet, China is currently adding capacity at a faster rate than global demand is increasing. China's paper industry has added on average 26% of new capacity every year since 2004. In 2008, the Chinese government once again reported massive additional capacity in China's paper industry, mostly concentrated in East China, especially Shandong. Some capacity expansion also occurred in South, Central, and Western China. **Figure J** shows annual fixed-asset investment in China's paper industry from 2004 to 2009. In 2009 and 2010, investment increased sharply in new projects of more than 200,000 tons, again concentrated in Shandong. The China Economic Information Service indicated that in 2009, year-on-year fixed-asset investment in China's paper industry grew 21.5%, despite some elimination of inefficient backward capacity and rapidly falling paper demand.

FIGURE J

Fixed-asset investment in China's paper industry, 2004-09



SOURCE: China International Capital Corporation, Papease, China Economic Information Service.

TABLE 3

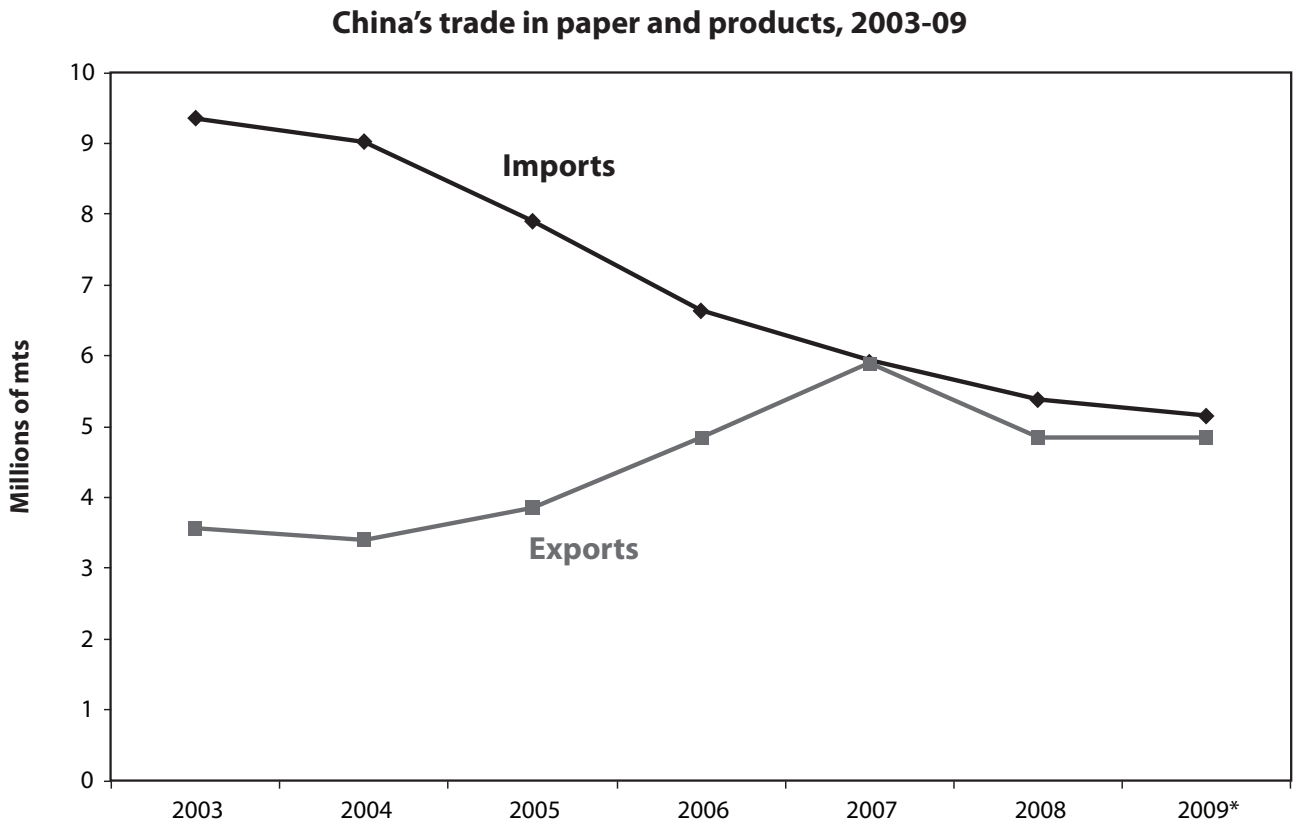
Major paper projects under construction in China, 2009-10

Company	Designed capacity (1,000 mt)	Products	Operational
Huai'an Yangguang Paper	100	Fine paper	
Hebi Ruizhou Paper	300	Fine paper	2011
Yueyang Paper	400	Munken paper*	2009
Fujian Nanping Paper	200	Copy paper	2010
MCC Paper Yinhe	200	Fine paper	2009
Nantong Oji Paper	800	Art paper	2010
Huatai Paper	800	Art paper	2010
Yibin Xingsheng Paper	15	Recycled paper	
Bohui Paper	350	Ivory card	2010
APP Hainan	1,400	Art paper	2010
APP Qinzhou	600	Ivory card	2010

* Munken paper is a branded, high-quality, bulky book paper made by Arctic paper in Sweden; the company created the brand in the early 20th century. Arctic's international headquarters has assured the author that Arctic has never produced and has no plans to produce Munken paper in China. Arctic's managers referred to Yueyang's product as "so-called" Munken paper.

SOURCE: Papease.

FIGURE K



* Estimated.

SOURCE: FAO, ChinaPaperOnline, author's estimates.

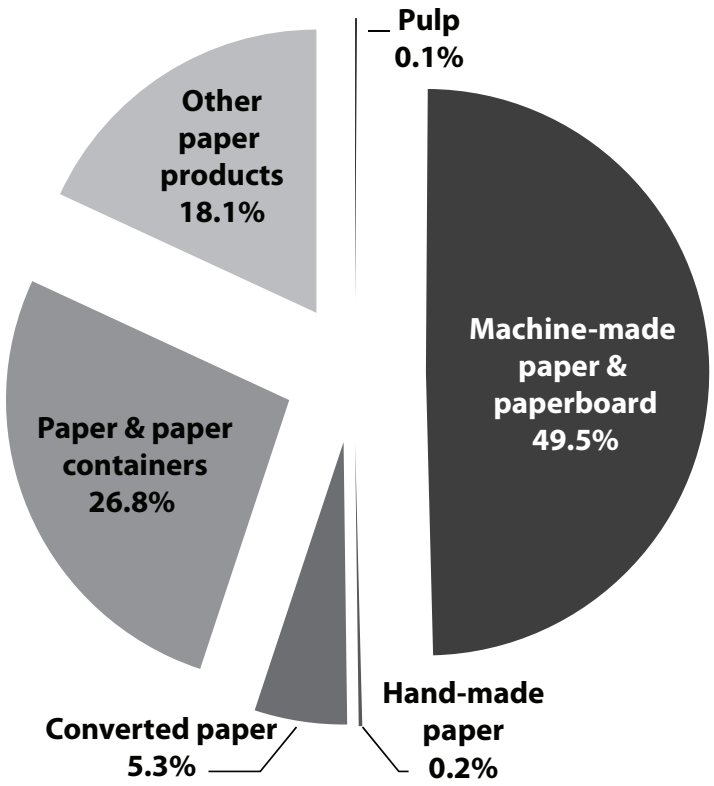
Consistent with the global paper and packaging market, China's domestic market is experiencing oversupply. Oversupply exists for nearly all products to some extent but most notably in printing and writing paper and containerboards. Supply of containerboards has spiked because the two largest Chinese companies, Nine Dragons and Lee & Man, have been aggressively adding capacity. Collectively, the two companies will have gone from a capacity of 8 million tons in 2007 to 15 million tons in 2009. Other companies are also building massive capacity. **Table 3** shows some large-scale projects and their expected tonnage, currently under construction, that will go online in the next couple of years.

Imports and exports of Chinese paper

Until 2007, China had been a net importer of paper. In 2009, with exports of $7.6 billion, China became a leading exporter of paper and paperboard in the world.[7] **Figure K** shows China's increasing exports and falling imports from 2003 to 2009. Given rapid growth in Chinese paper production capacity, the country is likely to become a big net exporter when global paper demand recovers.

FIGURE L

Exports of China's paper industry by product, 2008



SOURCE: China National Bureau of Statistics.

China is the world's largest importer of primary pulp and waste paper. According to data from China Customs, in 2005, China's imports of pulp accounted for 16% of total commercial-pulp output in the world.[8] Concurrently, China's imports of recycled paper comprised 61% of global exports of recycled paper. In 2006, China imported 8 million metric tons of pulp and 20 million metric tons of recycled paper, mostly from industrialized countries such as the United States and Japan. Domestically produced pulp only covered a tiny proportion of the Chinese paper industry's consumption. In 2008, pulp, mostly from Canada, the United States, and other forest-rich countries, again comprised the greatest part of imports for China's paper industry. As paper manufacturing increased, pulp imports rose to 9.5 million metric tons, accounting for 72% of total imports. Imports of other paper and paper products were 3.6 million metric tons and 125,000 metric tons respectively. Exports of paper and paper products were 4.1 million metric tons in 2008, explaining 75% of the total exports. The export levels of paper products and pulp were 1.3 million metric tons and 72,000 metric tons, respectively.

Figure L breaks down Chinese exports by product. Machine-made paper comprises about half of Chinese exports in the paper industry. As previously explained, Chinese exports of pulp and hand-made paper are insignificant.

FIGURE M

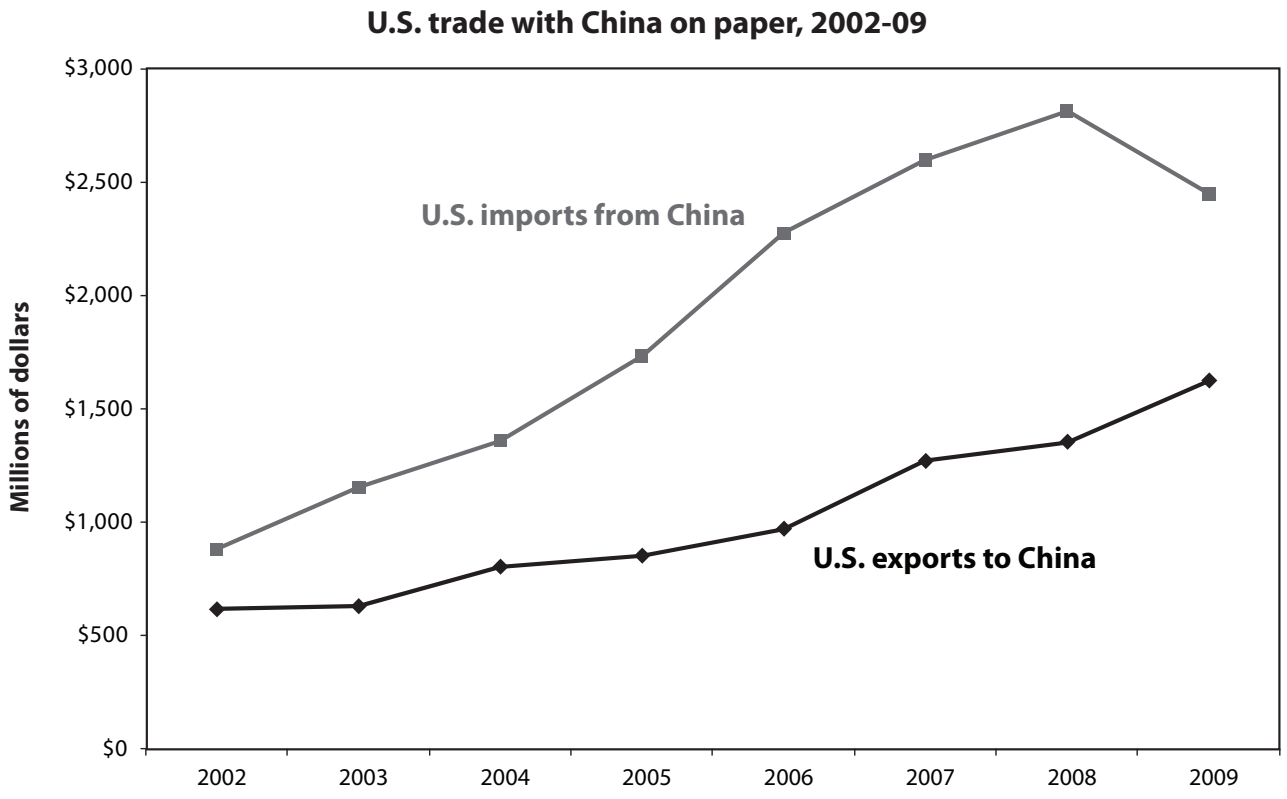
SOURCE: Development Research Center of the China State Council, China International Capital Corporation.

Although exports have led the growth of China's paper industry, analysts have difficulty deciphering final destinations for Chinese exports of paper products. For example, Asia's high demand for Chinese cardboard boxes appears to supply products for U.S. and European end markets.

In 2008, machine-made paper and paperboard constituted the major part of Chinese paper exports with exports of RMB22.9 billion ($3.3 billion). Exports of paper and paper containers, and of other paper products, reached RMB12.4 billion ($1.8 billion) and RMB8.4 billion ($1.2 billion), respectively. As **Figure M** shows, from 2002, Chinese imports of machine-made paper have been falling as exports have been rising. In the second half of 2008, both exports and imports of machine-made paper fell as the global recession took hold.

In 2001, China joined the World Trade Organization (WTO) and correspondingly, increased both exports to the United States and imports from the United States. In February 2010, the value of Chinese imports into the

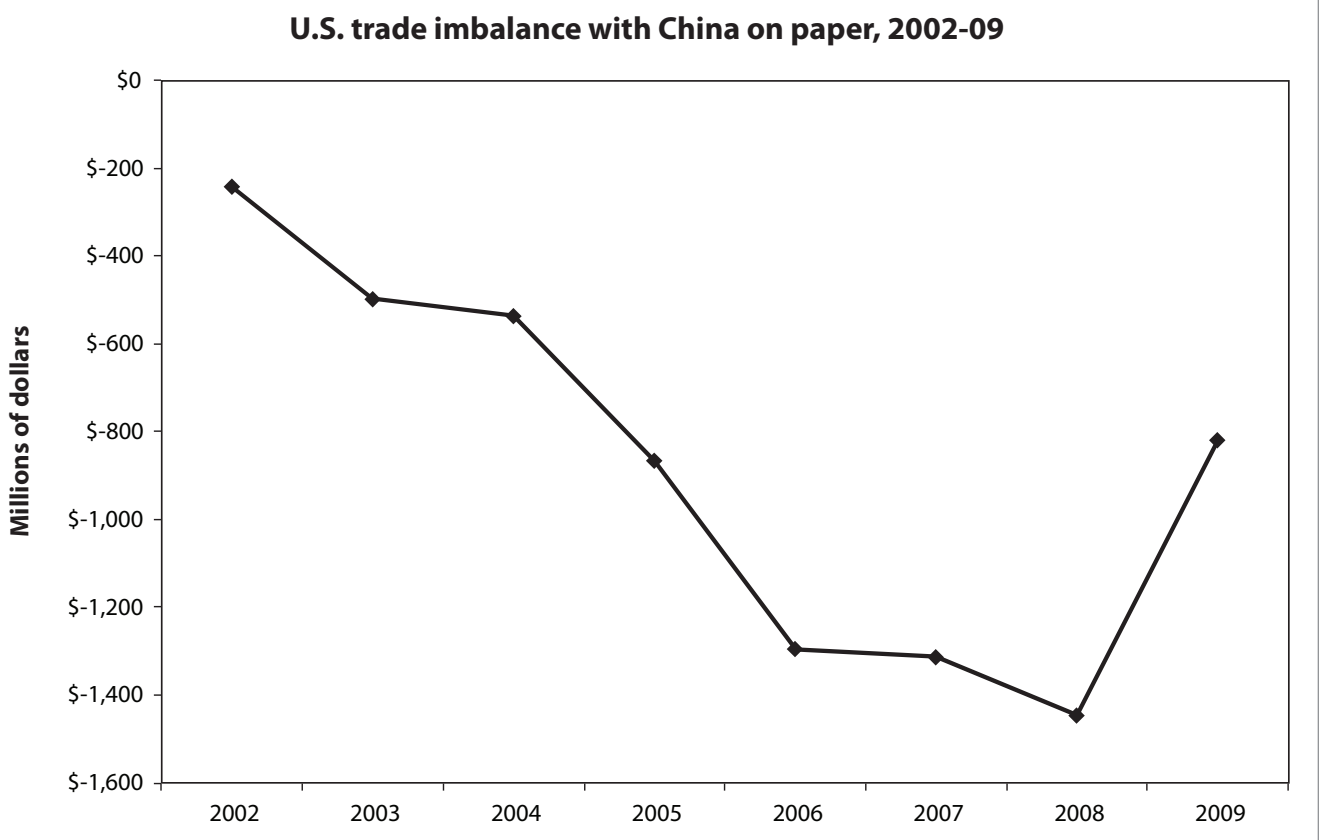
FIGURE N



SOURCE: USITC.

United States is growing at an annualized rate of 21.9%. **Figure N** shows that though both U.S. exports of paper to China and imports from China are growing, exports are growing from a much lower base and more slowly. Chinese penetration of the U.S. market has continued to grow despite the economic recession of 2008 and 2009. Indeed, U.S. imports of Chinese paper are rising faster than those from any other country. In 2009, China ranked second in volume (behind Canada and overtaking Germany) as the source of paper imports into the United States (U.S. International Trade Commission 2010). In the first quarter of 2010, China continued to hold this rank (U.S. International Trade Commission 2010). The exponential growth of paper imports from China has caused a persistent and growing trade imbalance from 2002, as captured in **Figure O**. The trade imbalance shrunk in 2009 as U.S. demand fell in the economic recession.

FIGURE O

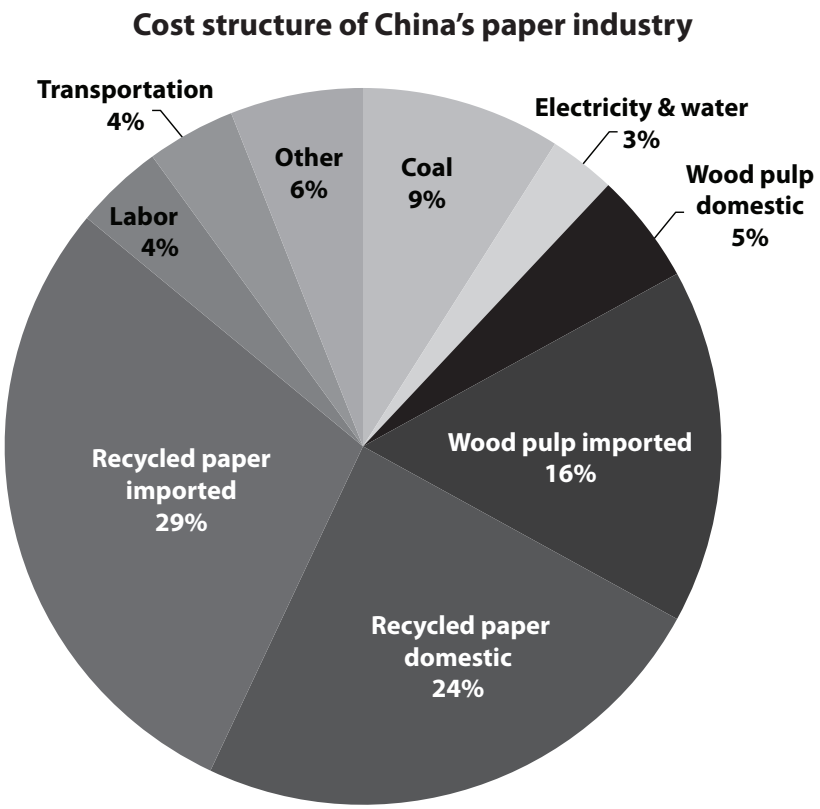


SOURCE: USITC.

Cost structure and prices in China's paper industry

Figure P describes the cost structure of China's paper industry. Recycled paper (mostly old corrugated containers or OCC) accounts for over half the costs of Chinese paper in this capital-intensive, resource-poor industry. On the other hand, labor provides about 4% toward the average costs of Chinese paper production, across all companies. China has no labor-cost advantage for the manufacture of paper. Indeed, labor costs rise to about 6% of total costs in the handful of large Chinese companies that employ more-professionalized staff, making their labor costs comparable to U.S. paper companies' at about 8%. In 2010, several provinces have also instituted mandatory wage increases, making Chinese labor costs more in line with those in the United States: these include 13% increases in Jiangsu, and 21% in Guangdong (Economist Intelligence Unit 2010) among the provinces that produce the most Chinese paper. As discussed in the previous section, imported raw materials contribute to about 45% of the total costs. China's paper-production lines mainly produce mechanical pulp and bleached hardwood kraft pulp (BHKP) for domestic consumption. Chinese imports have been relatively evenly split between softwood and hardwood pulp.

FIGURE P

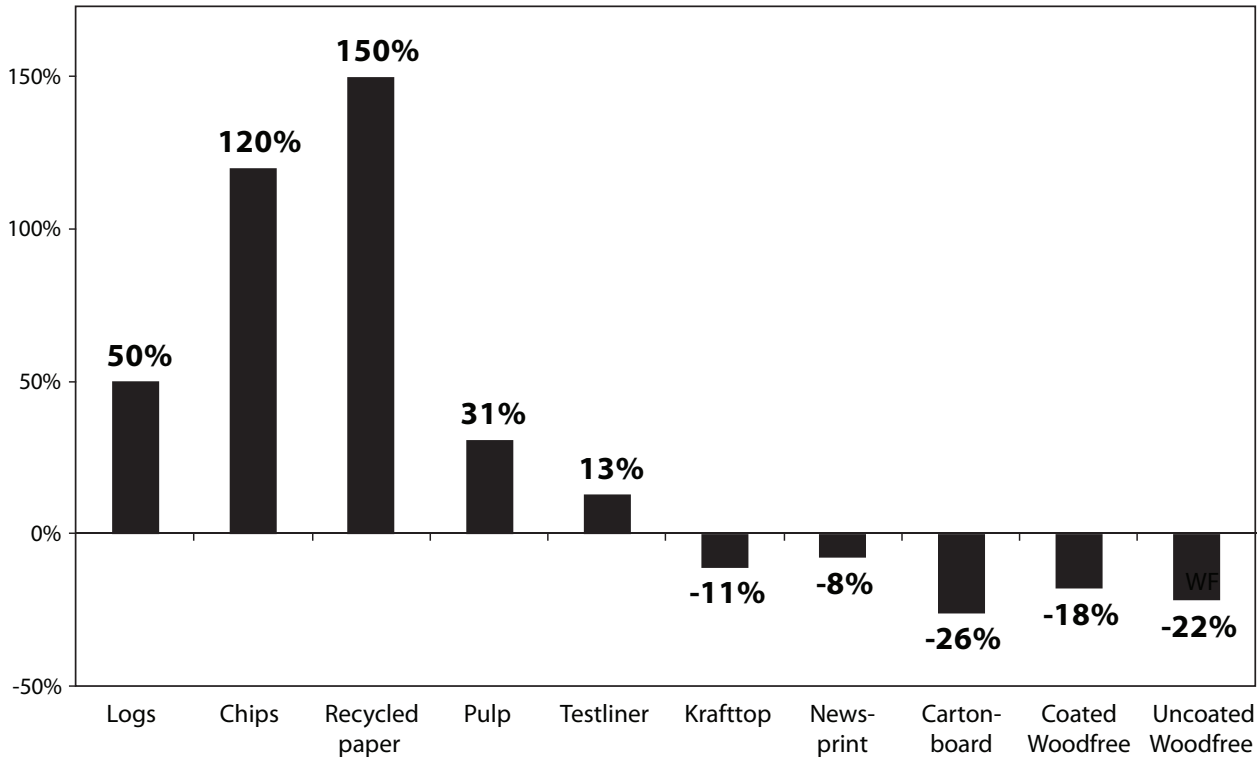


SOURCE: Deutsche Bank, Li & Man, Chenming, author's calculations.

Raw-material prices have been increasing much faster than paper prices. Indeed, paper prices have performed poorly over the past decade, with real prices down, while prices of component materials have shown double- and triple-digit increases. As **Figure Q** shows, the price of recycled paper, the major component of Chinese costs, has increased 160% between 2000 and 2008. Similarly, pulp has increased about 30%. Energy prices too have been increasing at a rapid rate since 2006. Both coal and oil prices have increased substantially with effects on the paper industry. Higher coal and oil prices affect operating costs such as electricity as well as transportation costs. However, because of global oversupply, paper prices have fallen in the last decade as indicated in Figure Q.

FIGURE Q

Changes in values of raw materials and paper products between 2000 and 2008



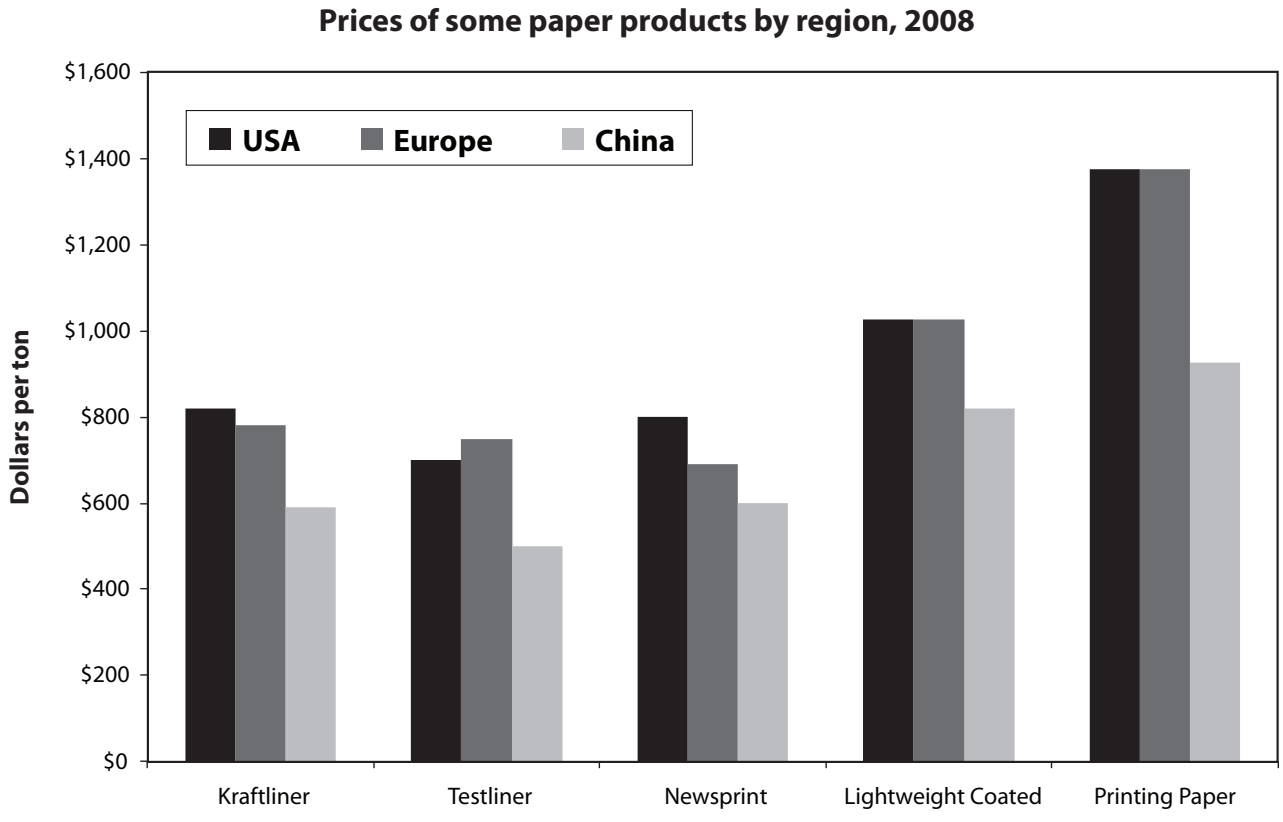
SOURCE: Datastream, Macquarie Research.

Figure R shows, that Chinese paper prices have been consistently lower than those of the United States or Europe across a range of products. After controlling for the poor quality of domestically sourced raw materials, the price differentials are difficult to explain without subsidies. Nearly all Chinese paper producers have some form of pulping capacity, but generally, imported pulp heavily supports paper production. Relatively few producers of pulp exist in China and in most cases they are integrated companies. Integrated paper companies, such as Yueyang, enjoy huge cost advantages as they can control for pulp costs through transfer pricing. However, few integrated paper companies exist in China. Also, a plantation should reach at least 20,000 hectares to enjoy economies of scale.[9] The great bulk of Chinese companies in this industry are small and medium-sized. Only Yueyang and Meili have plantations large enough to achieve economies of scale.

Role of government policy in China's paper industry

The Chinese government's policies on forestry assume high importance for the paper industry as the government allocates resources for plantation development and trade. The policies have systematically aimed to reduce China's dependence on imported raw materials by developing domestic wood fiber and subsidizing the paper industry's

FIGURE R



SOURCE: Datastream, Macquarie Research July 2008.

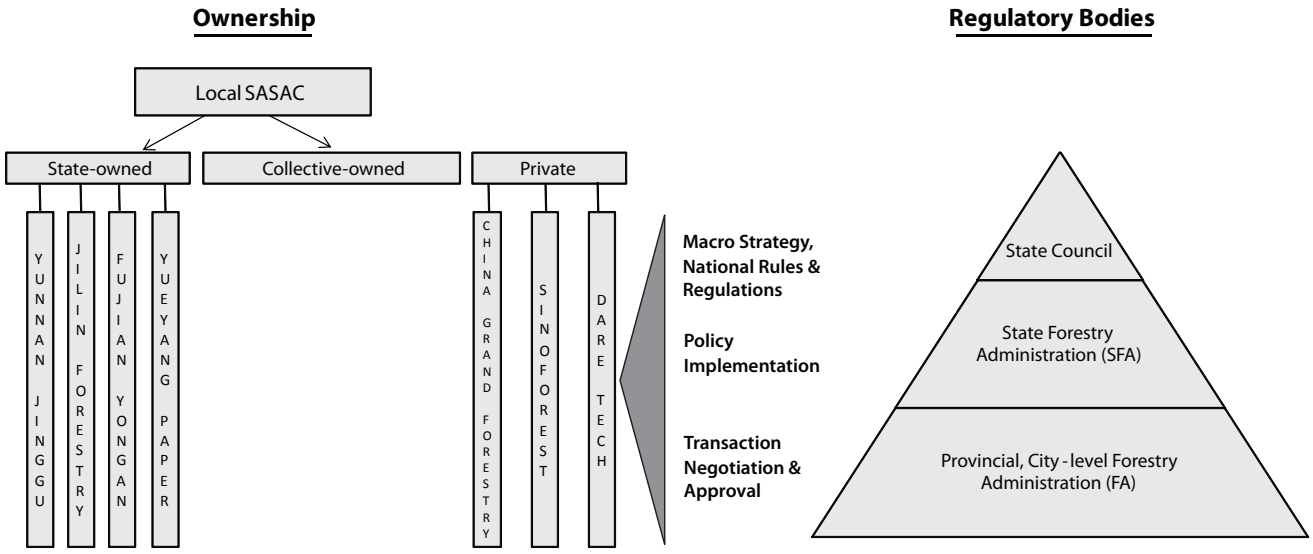
restructuring. Central and local governments provide subsidies to develop fast-growing, high-yield plantations; reduce taxes and fees on plantations to stimulate investment; reduce tariffs on imports of processing machinery; promote exports of wood and paper products through value-added tax (VAT) rebates; provide loans and loan-interest subsidies for technology renovation; promote foreign investment in state-owned enterprises (SOEs); and protect debt-ridden SOEs and small local companies with excess-production capacity through local governments' soft loans, subsidies, and loan forgiveness. The following subsections sketch the paper industry's ownership and regulatory structure, the role of local governments, and key legislation and policies.

Regulatory and ownership structure

All forests in China belong to the state, unless the law stipulates that they belong to the collectives (a form of indirect state ownership). The state also prices all land, including for paper plantations. Collectives and private companies can lease land for forest production. Leases typically run for 40 years. Relatively opaque, local, State-owned Asset Supervision and Administration Commissions, or SASACs, manage state and collective farms. The state directly manages about 40% of mostly natural forests, collectives manage about 58%, and private companies manage less than 2% (Zhu, Taylor, and Feng 2004; author's calculations).

FIGURE S

Regulatory & ownership structures of China's forests



SOURCE: Deutsche Bank.

The State Forestry Administration (SFA) and State Council provide broad directional policy for the paper industry. Operationally, local SFAs and provincial administrators exert enormous power as they oversee and negotiate forest usage and logging concessions as well as interpret the central government's laws (see **Figure S**). To expedite projects, Beijing's development policies have relegated approval of new investments to local governments. For example, for projects involving SOEs, local governments, rather than the SOEs' managers, have final approval. Local governments decide which land companies may use, and at what price. In some cases, local governments have leased land to companies at no charge (American Forest and Paper Association 2004). Local governments also provide subsidies for water and electricity, decide tax rates, tax holidays, and fee waivers. In practice, local governments have exceeded the central government's directives for development aid, including tax, financing, and trade measures, to shore up investment in their regions. Local governments have also strongly supported local companies in applying to the central government for preferential subsidies (e.g., the central government's loan-interest subsidies for paper companies investing in plantations). Interviews show that governmental decentralization has enhanced paper companies' needs for *guanxi*[10] with local governments. From securing logging concessions, to negotiating lease terms, to certifying new tree species, local governments can greatly impact companies' bottom lines.

The power of local governments manifests especially in:

- *Logging quotas:* The State Council, along with the SFA, sets five-year logging quotas, allocated to local governments to distribute among forests. The SFA's key principles include: preserving natural forest and capping total logging to below total new plantations. But, local governments allow special logging quotas in certain cases. For example, managers of commercial plantations above a "certain size" (determined by local governments), can develop their own quotas. Plantation managers can also determine the harvesting age of plantation-grown timber for industrial raw material.

- *Loan-interest subsidies/financing support:* All paper companies with plantations can apply for the Ministry of Finance's interest subsidies. Should local governments and the Ministry deem the project good for forestry development, companies can receive up to 6% interest subsidy for three years. Furthermore, the People's Bank of China (PBOC) has also set aside billions of renminbi as a credit line for companies in forestry. According to the SFA, it lent RMB4.7 billion ($562 million) in 2005 alone.
- *Preferential levy/tax treatments:* Interviews with the SFA revealed that the government has started to remove gradually the Forestry Resources Levy (FRL). The FRL accounts for 25% of a plantation's revenue, a huge boost to the companies' profits. According to the SFA, Guangdong and Hunan Provinces have eliminated the FRL completely. In addition, the central government gives full VAT exemption. Companies with plantations can also enjoy income-tax exemptions or reduced income-tax rates on case-by-case bases. Local governments' support can prove the deciding factor.

SOEs' engaging in public-land management, product processing and marketing, along with opacity over public forests' objectives and ownership, have hindered sustainable forestry in China (Turnbull 2007). From the mid-1980s, through financing from the World Bank and its affiliate the International Development Association, Beijing spawned several projects to enhance forest productivity, improve resource-use efficiency, and build institutional capacities for sustainable forestry management including: the Forest Development Project for state-owned farms in Heilongjiang, Sichuan, and Guangdong from 1985-90; the Da Xing An Ling Forest Fire Rehabilitation Project in 1988; the National Afforestation Project in 1990; and the Forest Resource Development and Protection Project in 1996. In 1998, the State Council implemented the Natural Forest Protection Program (NFPP) and logging ban, soon after several devastating floods. Industrial round-wood production from state-owned forests slowed down after the NFPP and the government started relying on plantations to supply timber. In practice, provincial governments and individual companies bear the brunt of enforcing and making operational sustainability standards. IKEA found that only 7% of its Chinese wood suppliers complied with its sustainability standards, encompassing emissions, chemical management, and human rights; about one-fifth of the company's global purchases of wood comes from China (IKEA 2009). Sino-Forest, Stora Enso, and CERC have also developed strategies for sustainable management of their Chinese plantations (Turnbull 2007). No external audits have been conducted on the effectiveness of companies' sustainability strategies in China.

Legislative framework

In 2002, the central government first announced its eight-year master plan for the forestry, pulp, and paper industries. The plan created major corporations with integrated operations in the three interlinking businesses of forest-pulp-paper. The government also outlined five major production areas for integrated paper production and encouraged the planting of industrial forests in flat areas with more than 400 millimeters of rainfall. Since 2002, integrated paper companies have benefited from favorable policies, including 1) highly independent tree planting and harvesting operations, 2) governmental rebates of forest-usage charges, 3) lower tax rates, and 4) local governments' favorable policies and subsidies.

Subsequent plans and policies reinforced the original state directives. In 2003, the "State Council's No. 9 Policy" set the legal framework for private companies to obtain forestry subsidies and concessions. Private companies could qualify for policy benefits such as tax exemptions and loan-interest subsidies. Forestry constitutes an agriculture activity and in 2006, the rural policies of the 11th Five Year Plan by the National People's Congress granted forestry businesses, including paper, special taxation status from 2006 to 2010.

Simultaneously, the Chinese government started promoting investment in the paper industry. In the 2005 edition of the Investment Guidance Catalogue for Domestic Investors, the government placed China's paper industry on the "encouraged" list. In December 2009, the listing had not yet been revoked, and China's paper industry has continued on the "encouraged list," despite the excess capacity discussed earlier (China Economic Information Service 2009).

In August 2007, seven PRC ministries and commissions jointly issued the "Main Points of Forest Industry Policy." The policy outlined the subsidies and other support that the government was offering listed paper companies owning forests such as Yueyang Paper, Huatai Stock , and Chenming Paper. Government subsidies included 1) using preferential tax policies to exempt forest-project income from total corporate income, 2) expanding loans to forestry through policy-oriented banks such as China Development Bank, 3) extending the life of existing loans from 12 to 20 years for construction projects to plant timber and to expand forests for industrial raw materials, 4) actively transferring forest rights to companies for industrial production, and 5) increasing discounted loans and loan-interest subsidies to the forestry industry and backward-integrated paper companies. On October 31, 2007, the National Development and Reform Commission (NDRC) also promulgated the advisory "Industrial Policy of China Paper Making Industry" to accelerate the movement of paper production from the north to the area south of the Yangtze River, and to increase forest-pulp-paper integration. The policy addressed industrial development and layout, energy usage, environmental protection, and market entry.

In December 2009, five governmental agencies, SFA, NDRC, Ministry of Finance, Ministry of Commerce, and State Taxation Administration, released a plan for the forestry sector's revitalization from 2010 to 2012 (LesProm 2009). The plan provides for governmental support and subsidies to 100 national leading enterprises and 10 large wood-industry clusters. The agencies aim to raise the sector's output value from RMB1.4 trillion ($209.9 billion) in 2008 to RMB2.3 trillion ($329.4 billion[11]) in 2012, as well as to maintain growth of around 12% annually. The agencies expect annual trade in wood products to exceed $90 billion, including over $50 billion in exports.

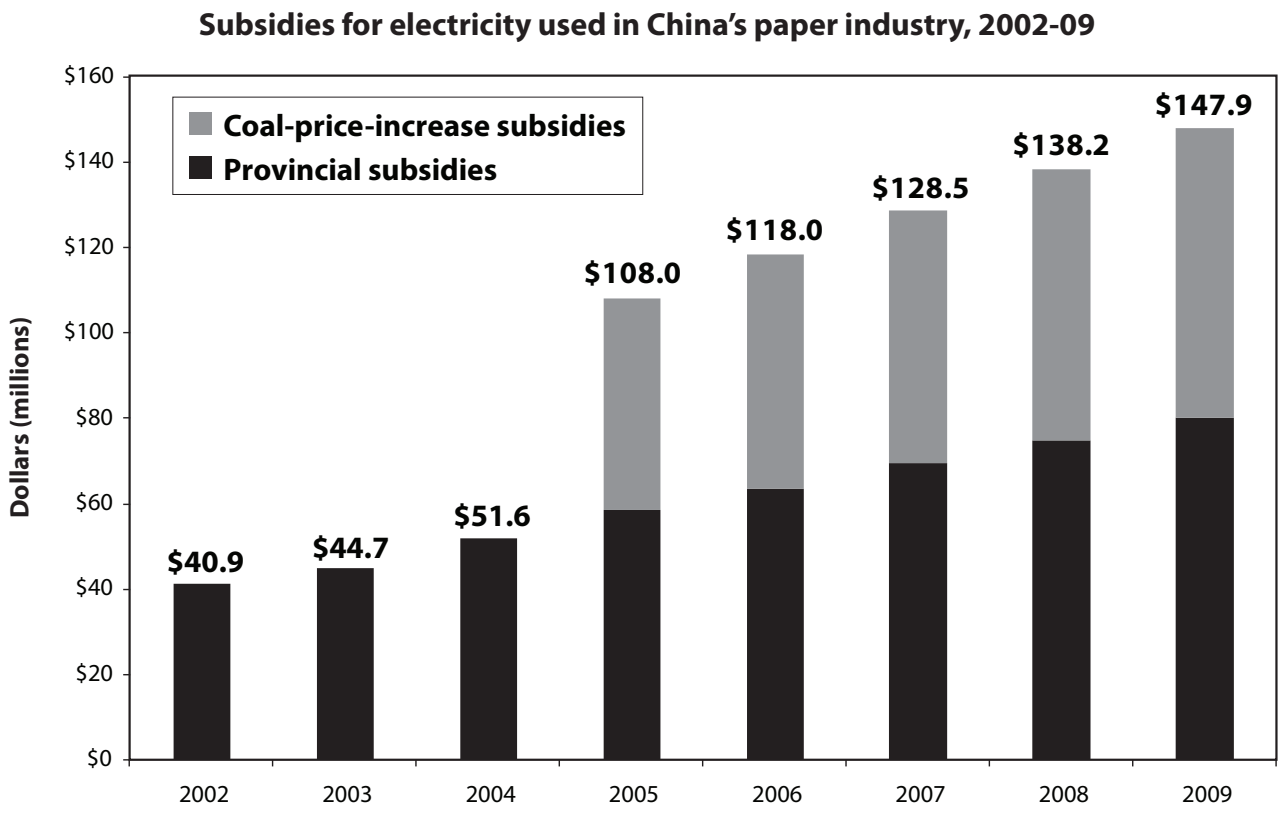
Subsidies to China's paper industry

This section presents calculated subsidies to China's paper and paper-products industry for electricity, coal, pulp, recycled paper, as cash grants to some companies, and through interest-free loans to some paper projects. Descriptions of the data and methodology, as well as the mathematical equations to calculate the subsidies can be found in the Appendix.

As Figure B showed, discernible subsidies to China's paper industry from 2002 to 2009 reached at least $33.1 billion. Chinese government subsidies have increased steadily over the last decade, but rose most sharply after 2004, with implementation of the "State Council's No. 9 Policy" in which private companies could obtain forestry subsidies and concessions. Subsidies fell sharply in 2009 as world prices and corresponding Chinese prices (on which calculation of subsidies are based) fell as well.

Because the calculations included only those subsidies that could be traced, confirmed, and recorded, the total subsidies to the Chinese paper industry in this report constitute very conservative estimates. The trend of rising subsidies explains to some extent why so many small and medium-sized companies remained profitable during this period despite an apparent squeeze between falling prices of paper products and very rapidly increasing raw-material prices. As discussed earlier, labor only accounts for 4% of the costs of producing paper. Additionally, the lack of economies of scale and scope strongly suggests that the inefficient and polluting Chinese paper industry has been getting substantial and growing support through most of the study period, probably from provincial governments that wield decision-making power.

FIGURE T



SOURCE: China National Bureau of Statistics, Interfax, Australian Bureau of Agricultural and Research Economics, author's calculations.

Subsidies for electricity

Subsidies for electricity used by China's paper industry reached $777.8 million between 2002 and 2009. The total for provincial subsidies approximated $483.1 million; the total for coal-price-increase subsidies, which took effect in 2005, reached $294.6 million. **Figure T** indicates the presence of some subsidies for electricity in each year of the period shown.

Subsidies or "price adjustments" for electricity permeate the system, especially at provincial levels, and some of these price adjustments occasionally become declassified (see Haley 2009b for a detailed discussion). The NDRC on April 16, 2007 required 14 provinces to halt immediately their preferential, electricity-price policy for local, high-energy-consuming enterprises, in an attempt to curb these industries' development (*Asia Pulse* 2007). Because this Briefing Paper relied solely on published prices and the NDRC's disclosures on provinces that had subsidized their paper industries, the provincial subsidies to electricity are probably underrepresented.

The coal-price-increase subsidy reflects the dominance of coal in China's electricity-fuel mix. Substantial increases in electricity output have increased demand for thermal coal. The government is increasingly linking electricity prices with coal costs, and electricity consumption with the introduction of more transparent pricing mechanisms. In 2005, the State Council approved the implementation of a new pricing mechanism to link electricity charges to coal costs. Increases in coal prices are passed on to electricity consumers when the average coal price changes by more than 5%

over six months. If changes in the average coal price are less than 5% in six months, the percentage-price change carries over to the next six months. However, as **Table 4** reveals, the central government simultaneously provides subsidies for electricity generation, in effect since 2005, to offset the higher electricity prices. These subsidies are then passed on to electricity's customers, including the paper industry (Haley 2009b).

TABLE 4

Selected subsidies for electricity in China

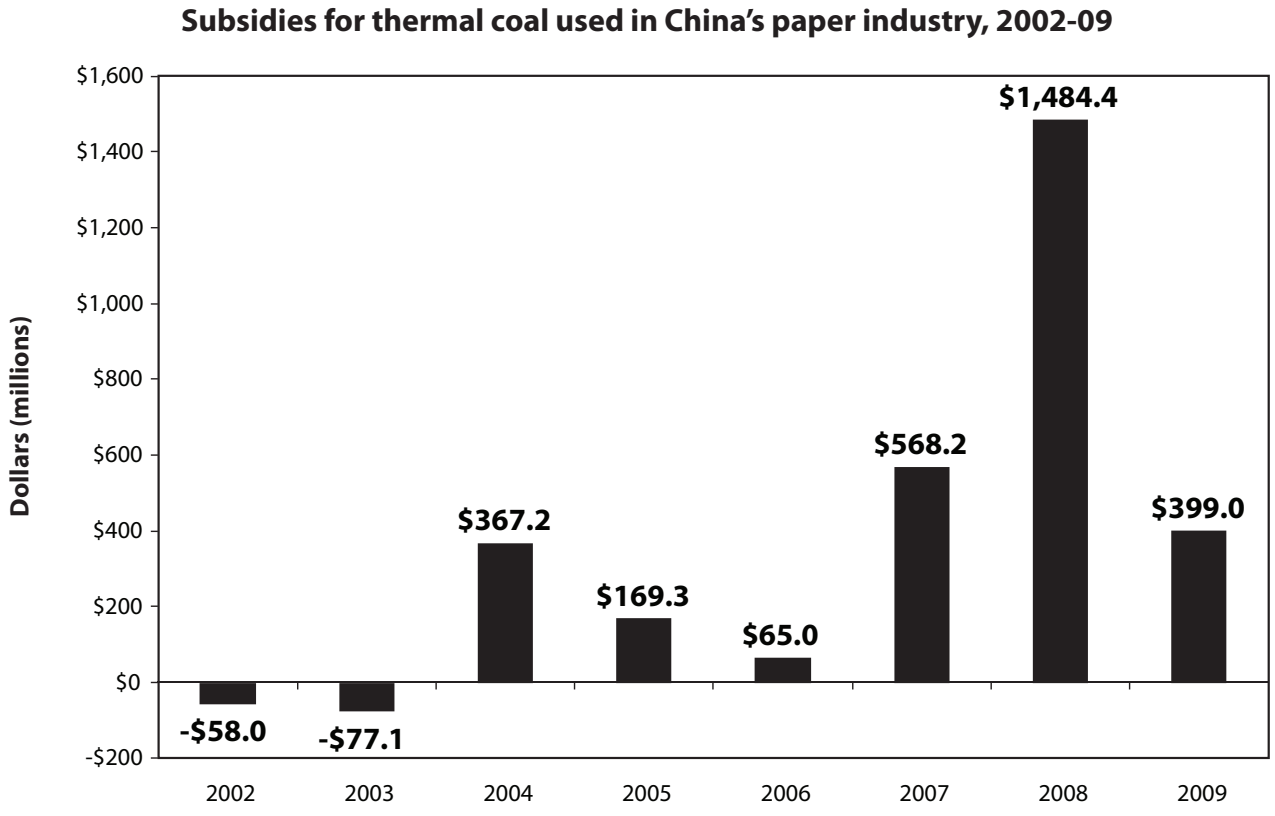
	Price changes and subsidies (U.S. cents per kilowatt hour)
Average regional increases in sales prices	
Eastern China	0.22
Central China	0.36
Southern China	0.37
Northeastern China	0.17
Average increase (all regions)	0.3
Subsidies for state government projects	
Relocation compensation for new projects	0.78
Support for the development of renewable energy projects	0.0125
Subsidies for power generation projects	
Compensation for losses caused by the rise in coal cost and transport fees	0.122
Compensation for installation of desulphurization facilities	0.03
Subsidies for grid construction	
State power grid construction	0.026
Rural power grid construction	0.007
Subsidies for local government projects	
Subsidies to small hydropower projects, gas fired projects, wind power projects, and WEP projects	0.016

SOURCE: Derived from data provided by Australian Bureau of Agricultural and Research Economics, *Interfax China Energy Weekly*.

Subsidies for coal

Subsidies for coal consumed by China's paper industry reached $3.1 billion between 2002 and 2009. The total for thermal-coal subsidies approximated $3.1 billion; the paper industry is a small user of coking coal and the total for these subsidies reached $12.7 million. **Figures U** and **V** indicate the presence of some subsidies for thermal and coking coal, respectively, in each year of the period shown. Subsidies for coal increased most steeply in 2008, when the price of thermal and coking coal soared. Chinese subsidies for thermal coal have generally corresponded to world prices, rising and falling in tandem. As a major producer of thermal coal, China has also directly influenced domestic prices by ramping up domestic supply in response to rising world prices. Subsidies for thermal coal used by China's paper industry (whose calculations depend on market prices) may show the delays that transpire between producing demanded coal and getting it to market. Interviews with industry analysts indicate that until 2004, China's paper industry was paying a premium for thermal coal. Similarly, the Chinese paper industry was paying a premium for coking coal in 2009. In 2009, world coking-coal prices plummeted by 57%, while Chinese coking-coal prices fell by only 22%.

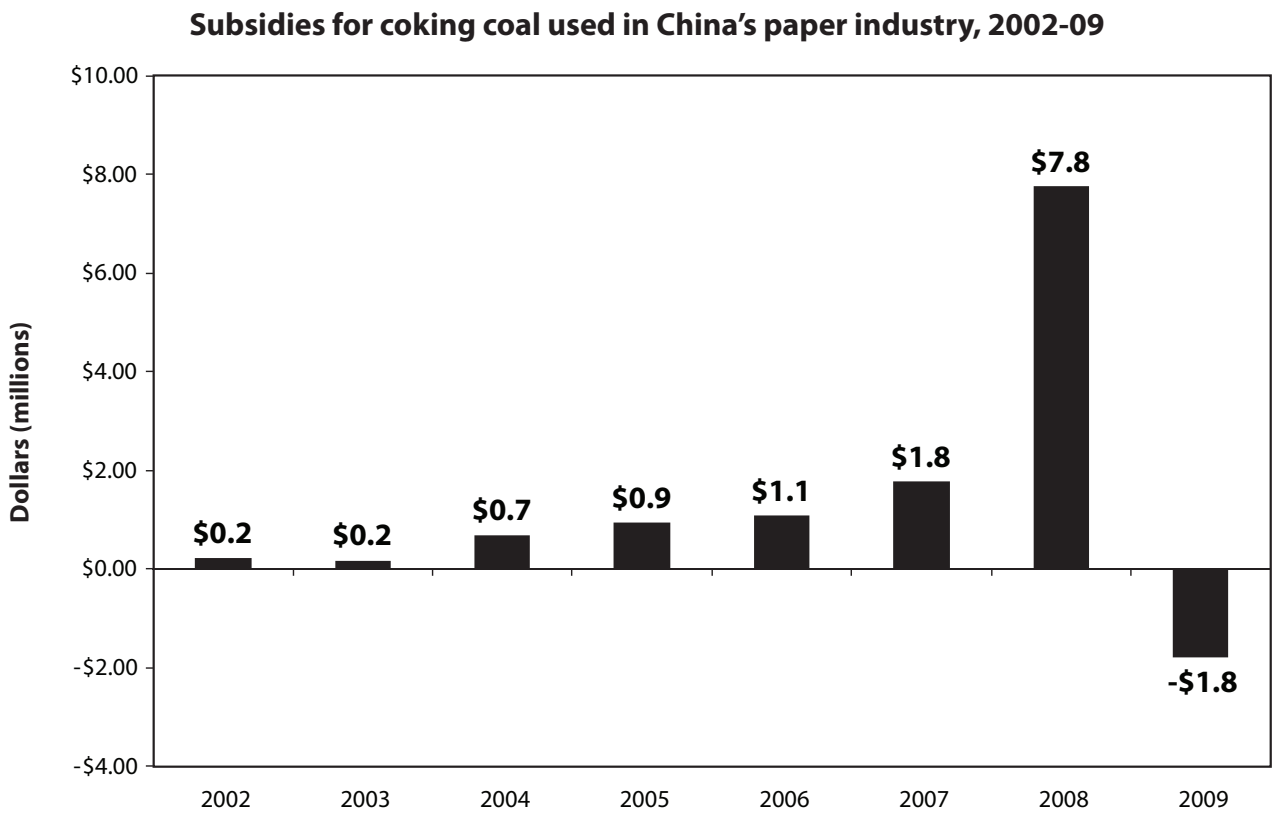
FIGURE U



SOURCE: China National Bureau of Statistics, Steelonthenet, International Energy Agency, author's calculations.

China has the world's largest coal market, double the size of the U.S. market. While down from a post-reform high of 76% in 1990, coal still meets over two-thirds of China's energy needs. Over 75% of the demand growth in recent years has come from the power sector, as electricity demand boomed. Of the 50% of coal not consumed by the power sector, the majority is sold directly to industry for use in boilers, coking ovens, and on-site ("inside the fence") power generation (Haley 2008). Since the 1980s, China has gradually liberalized coal pricing. As with many other Chinese goods, a two-tiered price system emerged, the first set by the NDRC for plan-allocated quotas and the second set by the market for other demand. At the beginning of 2007, the Chinese government abolished the two-tier system, and both contract and spot coal must now be negotiated at market rates. However, legacy behaviors linger, especially among the SOEs (Haley 2008; 2009b).

FIGURE V



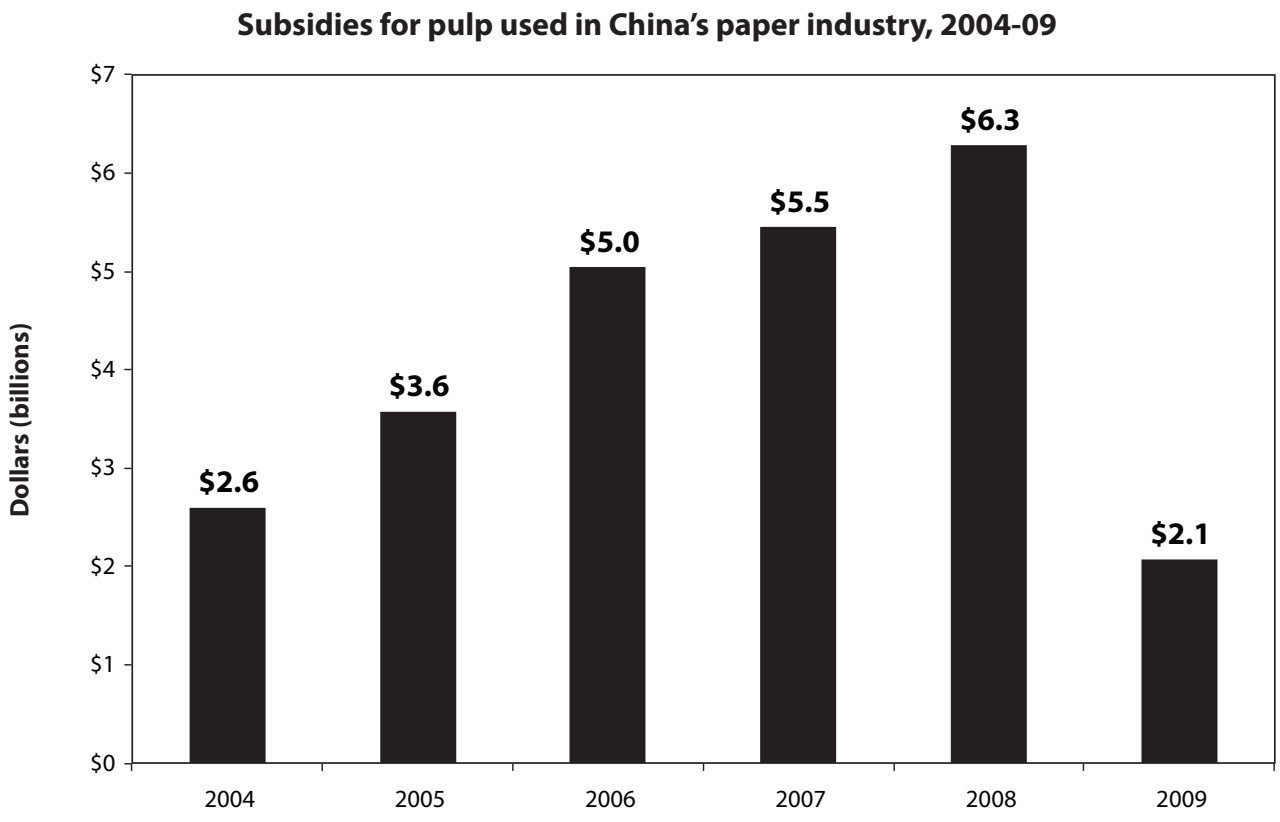
SOURCE: Steelonthenet, CEIC, China National Bureau of Statistics, International Energy Agency, author's calculations.

Subsidies for pulp

Subsidies for pulp used by China's paper industry reached $25 billion between 2004 and 2009, when data were available. **Figure W** indicates the presence of some subsidies to pulp (all grades) in each year of the period shown. Subsidies for pulp fell sharply in 2009 when the world price of pulp plummeted during the recession. The corresponding Chinese subsidy (calculated as a differential between Chinese and world prices) decreased in tandem with the world price.

The study greatly underestimates subsidies to pulp as it uses pulp prices paid by most private companies for paper production. Yet, as discussed before, large, backward-integrated companies and SOEs get highly discounted pulp through transfer-pricing mechanisms for which data are publicly unavailable (Xie and Chen 2009). Costs of land take up between 30% and 60% of fast-growing forest costs, which in turn take up about 50% of the costs of domestic pulp. But the Chinese government subsidizes land for integrated producers and those acquiring land in desert areas, reducing the costs of pulp for these companies. For example, Chenming has been acquiring rental land in the Zhanjiang region to establish its own timber supplies. Significant cost advantages accrue to Chenming when using its own timber. On average, the cost per cubic meter of Chenming-owned trees hovers around RMB200 ($29.2) compared with locally-acquired timber costing about RMB300–400 (about $43.9-58.5). On the other hand, Meili's land rental is zero because it is using this plantation land for desert forestation.

FIGURE W



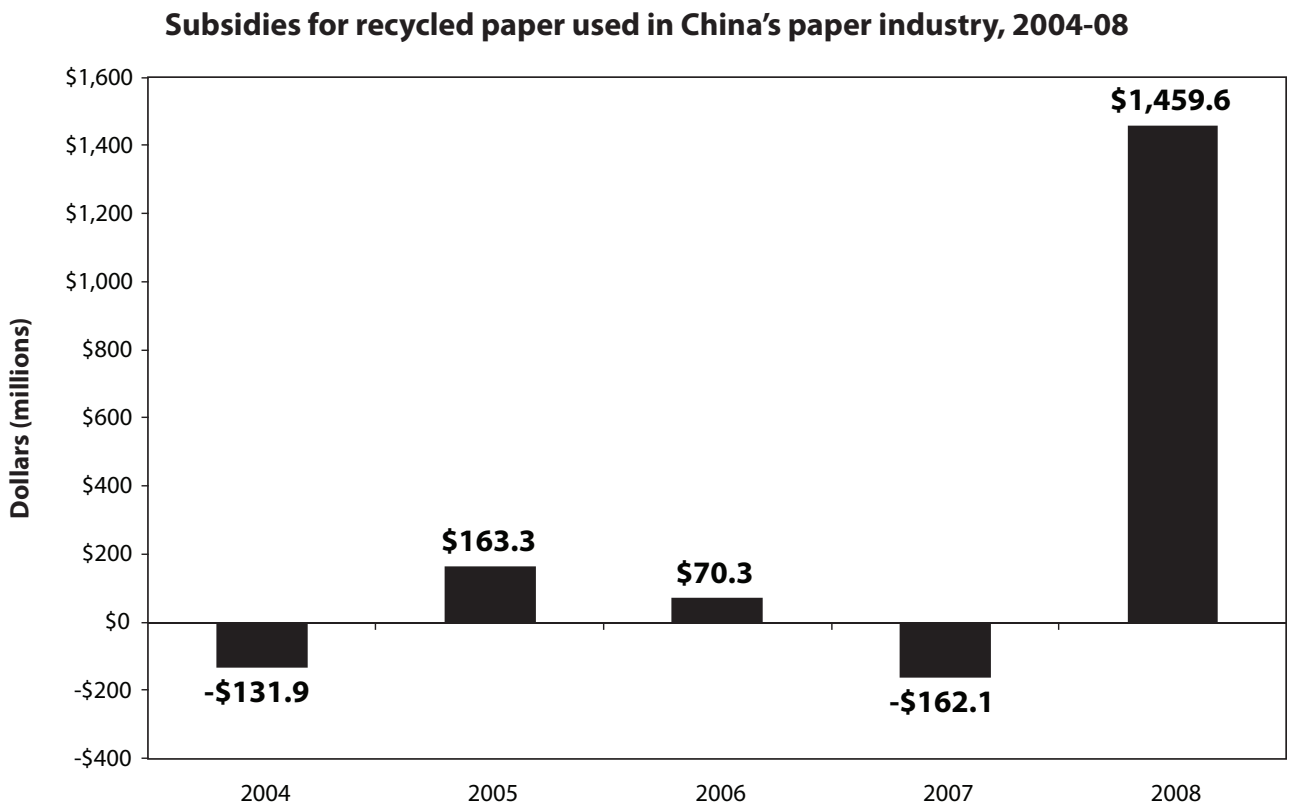
SOURCE: Food and Agricultural Organization, Macquarie, China Market Pulp Report, author's calculations.

Subsidies for recycled paper

Subsidies for recycled paper consumed by China's paper industry reached $1.7 billion between 2004 and 2008, when data were available. OCC comprises the largest component of recycled paper because of domestic-box recovery. **Figure X** indicates the presence of some subsidies for recycled paper in each year of the period shown. The spike in subsidies in 2008 pertains to the largest Chinese companies; it shows the sharp increase in the world price that was not reflected in the Chinese price for recycled paper. Because of incomplete data on recycled paper, no subsidies could be calculated for 2004, 2007, and 2009. Indeed, the Chinese paper industry appeared to have paid a premium for recycled paper in 2004 and 2007.

While the United States and Europe have sophisticated collection networks, China has numerous, inefficient, small, paper-recycling operations; nationwide, China's collection rates hover around 30%, among the lowest in the world.[13] The average collection rate in the world approximates 50%, with the United States having a collection rate of about 52%, the UK 61%, and South Korea 85%.[14] The process of collecting recycled paper is expensive and can be capital intensive. Consequently, only a few of the very largest companies, such as Nine Dragons and Lee & Man, have backward-integrated recycling operations. Small and medium-sized paper companies generally directly bear the costs of purchasing low-quality, domestically recycled paper, and little data exists for these transactions. These small and medium-sized companies also use substantial amounts of imported, recycled paper that they purchase at global, market prices and sometimes at a premium. Data in 2008 came from the largest, integrated companies, and before the global market softened for recycled paper.

FIGURE X



SOURCE: Morgan Stanley, China Recovered Paper Report, Food and Agricultural Organization, author's calculations.

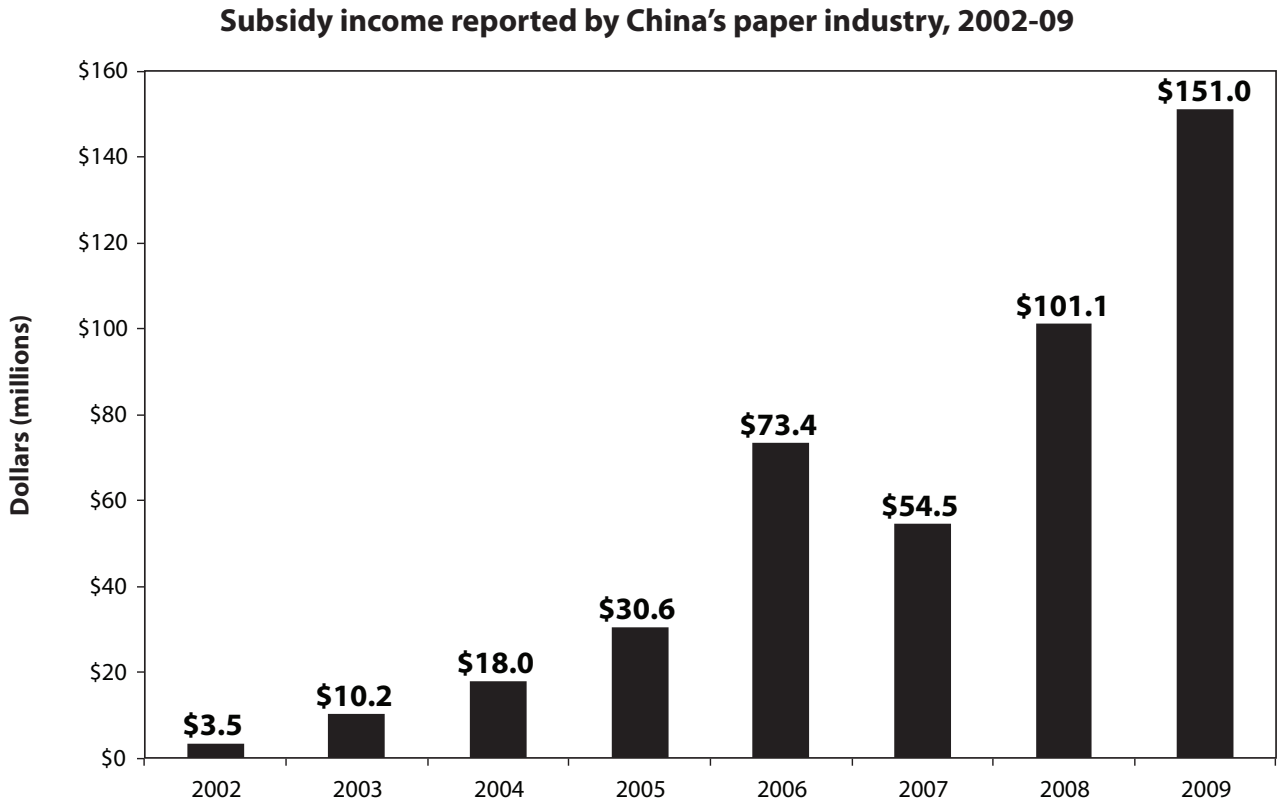
Subsidies reported by companies

Subsidies reported in the annual reports of China's paper companies reached $442.2 million between 2002 and 2009. The 212 largest companies in this industry reported these as "subsidy income" in their annual reports. The great majority of these companies had no legal needs to disclose cash grants or subsidies from the government, and many of their managers probably misunderstood reporting requirements (see Yu 2009), so the reporting is sporadic with much missing data. **Figure Y** indicates the presence of some reported subsidies in each year of the period shown. The subsidies shot up in 2008 and 2009 when Lee & Man and Nine Dragons received large cash grants, which they reported.

Loan-interest subsidies

In 2001, the State Development and Planning Commission (now the NDRC) identified 43 projects in China's paper industry that would receive loan-interest subsidies from 2002 to 2010. Of these 43 projects, the NDRC specifically provided $2.1 billion in loan-interest subsidies to 13 projects that focused on integrating paper-processing facilities with

FIGURE Y



SOURCE: Company annual reports.

fast-growth, high-yield plantations (American Forest and Paper Association 2004). **Table 5** lists the 43 projects that the NDRC chose and the 13 that received specified subsidies. The projects cover China's Southern coast, Yangtze River delta, Huang-Huai plains, Northeast, and Southwest. The analysis assumes that the identified subsidies were equally distributed across the years of study.

Loan-interest subsidies are special Chinese government funds allocated from the central budget or raised from treasury bonds to finance plantations or renovations in paper-mill technology. These subsidies provide capital reimbursement or the loan-interest amount as start-up capital for qualifying projects. The standard subsidy term is two years. For enterprises on China's "top enterprises" list, the subsidy term is three years. However, exceptions take place and Shandong Chenming received a five-year loan-interest subsidy in 2004. In 2009, the Ministry of Commerce announced that for forestry clients, the maximum term for forestry and agriculture loans would be 10 years; the maximum term for instant forest, ecological construction, and follow-up industrial development would be 20 years; and the maximum term for forest paper-processing projects would be 12 years (State Forestry Administration 2009).

The estimate of $2.1 billion for loan-interest subsidies understates the amount of such subsidies from 2002 to 2009. Public information could not be gathered on how much money the government granted to the other 30 paper projects identified in 2001, or to those the government chose later for these subsidies. Interviews revealed that the Ministry of Finance could provide about 20% of the amount of a loan for plantations and technology renovations in the form of loan-interest subsidies, state-owned policy banks (such as the China Development Bank) could provide 70% of the capital in the form of loans that companies may never repay, and provincial and municipal governments could

TABLE 5

National Development and Reform Commission's 43 projects planned for implementation, 2002-10

Province	Project funded by loan-interest subsidies
Northwest	
Xinjiang	Xinjiang Zhunger Biology Engineering Co. Ltd
	Yili Forest & Paper Co. Ltd. Wood Base
Ningxia	Ningxia Meili Paper Company Wood Base*
	Inner Mongolia Pangu Group*
	Inner Mongolia Dongda Group Liner Board Project integrated with Shaliu Plantation
	Gansu Zhangye Forest & Paper Co-operative Project
Southwest	
Sichuan	Yibing Paper Co. Ltd. Wood Base
	Changjiang Paper Co. Ltd. Wood Base
	Leshan Paper Mill Wood Base
	Zhongzu Paper Company Wood Base
Guizhou	Qianbei Bamboo Pulp and Forest Paper Project
	Yun Nan Yunjing Forest & Paper Company*
Southern Coast	
Guangdong	Guangzhou Paper Co. Ltd.*
	Zhanjiang Pulp Mill
	Guangning Paper Mill
Guangxi	Nanning Phoenix Paper Co. Ltd.
	Liu Jiang Paper Mill
	He Zhi Co. Ltd.
Fujian	Nan Zhi Holding Co. Ltd.*
	Qingshan Holding Co. Ltd.*
	Longyan Paper Industrial Co. Ltd.
	Yuexiu Shaowu Pulp and Paper Co.
Hainan Island	Hainan 600,000 ton pulp mill
Yangtze River Delta	
Jiangxi	Jiangxi Paper Co. Ltd.
Hunan	Yueyang Paper Group Co. Ltd.*
Anhui	Anhui Forest & Paper Co. Ltd.
Northeast	
Heilongjiang	Jiamusi Paper Group Wood Base
	Heilongjiang Sida Paper Co. ltd. Wood Base
	Qiqihaer Paper Company Wood Base*
	Mudanjiang Forest & Paper Wood Base
Jilin	Yanbian Paper Company Wood Base
	Fulun Paper Co. Wood Base
Liaoning	Liaoning Paper Making Wood Base
	Liaoxi Paper Making Wood Base

cont. on page 33

TABLE 5 (CONT.)

National Development and Reform Commission's 43 projects planned for implementation, 2002-10

Province	Project funded by loan-interest subsidies
Huang-Huai Plains	
Henan	Henan Jiaozuo Forest & Paper Group C. Ltd.
	Puyang Paper Mill*
Shanxi	Shanxi Xiangfen Paper Group*
Shandong	Shandong Tralin Paper Co.*
	Shandong Sun Paper
	Rizhao Pulp Company Material Base JV*
	Huatai Group Material Base*
	Fenglingdu Paper Industrial Group
	Chengwu Hongda Paper Co. Ltd. Material Base

* NDRC identified amounts of loans to these projects.

SOURCE: Derived from American Forest & Paper Association, 2004, Stewart, 2007.

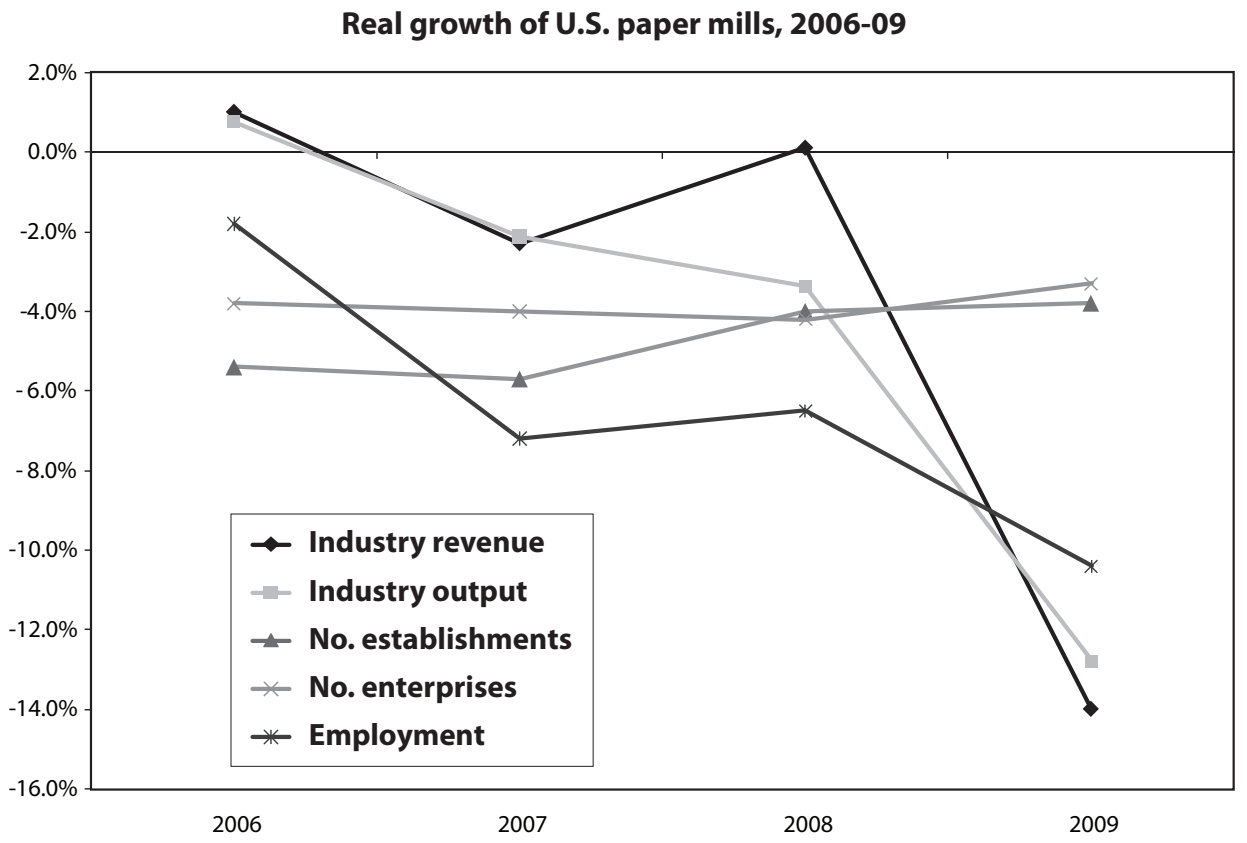
provide 3% (as well as other incentives, depending on municipal budgets) with companies and other sources raising the remaining balance. Companies may have used some of the money earmarked for technology renovations for inefficient capacity expansion (see Xie and Chen 2009 for inefficient uses of forestry subsidies).

Implications for U.S. industry

A decade ago, China compared with India in national competitive advantages for the support of a paper industry. In the first quarter of 2010, while India ranks 24th in exports of paper to the United States, China has rapidly become the largest producer of paper in the world and the second-largest exporter (behind Canada) to the United States (U.S. International Trade Commission 2010). This Briefing Paper has argued that Chinese government subsidies and loans have fueled the enormous growth, excess capacity, and low prices that characterize China's paper industry. As discussed earlier, in December 2009, the Chinese government announced new policies for continued support of its paper industry. Data show that the Chinese paper industry will continue to expand for at least the next three years based on current policies and planned expenditures. Indeed, in 2009, Chinese paper-production capacity grew 21.5% over the previous year, despite the global economic slump.

The saturated Chinese market for paper cannot absorb present or planned output of Chinese paper. Consequently, one can reasonably assume that exports have driven the growth of China's paper industry. Chinese policies on foreign investment also continue to emphasize production, to fuel, and to produce exports for at least the next three years. For example, China's "Catalogue Guiding Foreign Investment in Industry"[15] strongly supports foreign investment of chemical wood-pulp projects above 300,000 tons; chemical mechanical-pulp projects above 100,000 tons; investments in plantations to integrate forest-wood-pulp; and investments in high-quality paper and paperboard production (except newsprint paper). The policies favor joint ventures with domestic partners over wholly owned enterprises and target higher-value-added sectors. Attracted by favorable Chinese governmental policy, some U.S. companies, such as Kimberly-Clark, have announced that they will expand their manufacturing facilities in China (HKTDC 2010).

FIGURE Z



SOURCE: Author's calculations, IBISWorld, Federal Reserve Board.

Cheap, subsidized Chinese paper exports have affected the U.S. paper industry.[16] Despite comparable cost structures, high efficiencies, and plentiful natural resources, U.S. paper companies have failed to compete globally or nationally on price against much-cheaper Chinese imports. In 2010, the United States remains a net importer of paper and paper products. Imports from China are rising faster than those of any other country for this industry, with the value of U.S. imports from China growing at an annualized rate of 22%. **Figure Z** shows how U.S. paper mills have shrunk with drops in output, employment, revenues, and number of companies, corresponding to the rise in Chinese imports shown in Figure N. Unless U.S. government policy and regulation reverse the trend, the United States may well become the supplier of raw materials for Chinese paper production until Chinese plantations reach their planned potential, with continued erosion of profitability and manufacturing jobs in the paper industry.

*—This is the second of three EPI reports on Chinese subsidies by **Usha C. V. Haley**. She can be contacted through http://usha.tel. More information on Chinese subsidies is available at http://www.ChinaSubsidies.com.*

*—The author thanks **Per Ekander**, **George Haley**, **Jake Handelsman**, **Keith Romig**, **Rob Scott**, and **Mike Wessel** for helpful comments and Anna Turner for research assistance.*

*—EPI is grateful to the **Alliance for American Manufacturing** for support of our research and publication programs.*

Appendix: Data, methods, and measurement of variables

The WTO has generally defined subsidies as unrequited transfers from governments to enterprises, including direct payments, tax concessions, contingent liabilities, and the purchase and provision of goods and services (World Trade Organization 2006). China defines subsidies more narrowly as unrequited direct payments from governments to enterprises, including the returning of VAT (Girma, Gong, Gorg, and Yu 2007). This Briefing Paper uses the WTO definition.

Data

Institutional problems (including poor infrastructure to gather and to disseminate data) and strategic efforts to disguise operations (through the creation of an informational black hole) hinder the collection of high-quality industrial and company statistics in China.[17]

Subsidies exist in all industries that the Chinese central and provincial governments consider important to maintain economic stability and contribute toward strategic goals (Haley 2009a). The Chinese central and provincial governments have used at least 14 different subsidies (Haley 2006). The Chinese governments have also historically supported inefficient firms through subsidies (Claro 2006; Haley and Haley 2008). Since 2005, data on China's paper industry have been particularly hard to gather following the consideration of anti-dumping actions by the U.S. Department of Commerce. Also, as discussed earlier, about 88% of the total companies in China's paper industry are small, while 12% are medium-sized: the operations of these companies are difficult to track in China. Only the 10 largest companies release systematic accounting data.

Researchers and analysts have also found subsidies to coal and electricity very tricky to measure because of the problems with the quality of energy statistics as well as the quality of accounting data (Birol and Keppler 1999). China's size, the rapidly shifting make-up of its quasi-market system, and the tendency of provincial officials to lie to boost their political fortunes, magnify the problems of data quality (Haley, Haley, and Tan 2004). Chinese central and provincial governments also covertly and overtly use many policy instruments to reduce activity costs. For example, analysts from the International Energy Agency (IEA) noted major problems with energy statistics submitted by China, including the substantial discrepancy between coal supply and demand arising from poor data on stock changes. Consequently, the IEA started compiling its own statistics to estimate Chinese coal production based on demand-side statistics (Haley 2008).

Current and recent data on forests and agriculture in China are particularly thorny to obtain from official sources. Haley, Haley, and Tan (2004, 139-40) discussed how for several years, China had routinely released misleading data showing high stocks of fish, thereby allaying fears of dwindling global fish reserves—until the United Nations Organization's observers noted increasing unrest in Chinese fishing villages because of fish shortages. Independent sampling revealed serious shortfalls in China's fish reserves with many species on the verge of extinction. Yet, the Food and Agricultural Organization (FAO), year after year, had released rosy, official data on China's extremely high stocks of fish. Currently, the FAO uses its own estimates on China's forestry reserves and businesses. These estimates often contradict China's official statistics. Because of the problems identified, the analysis for this study often used FAO statistics.

China's official statistics are generally riddled with inconsistencies. For example, the reported data on growth in GDP and fixed investment, as well as investment and savings flows, are incompatible. Services are poorly covered in national account measures and consumption of all kinds, including industrial consumption, is probably grossly underestimated (Haley 2009b). Lack of regular and rigorous industrial surveys weaken the foundation of published official statistics.

Data on prices for domestic (rather than imported) pulp and recovered paper are particularly difficult to obtain, and the study relied on estimates from investment houses on domestic companies' operations.

Accounting data in China are especially opaque. Despite Beijing's goal of adopting international accounting standards, certain activities, such as "related-party transactions," are not consistent with international standards, so officials and managers fail to report them. Under international accounting norms, managers should clearly disclose deals between companies with overlapping ownership. But, because overlapping ownership permeates China, detailing individual transactions would overwhelm financial reports. Consequently, "pure state-controlled enterprises" have no disclosure requirements (Haley 2009b). This analysis used subsidy income reported in annual reports from 212 of the largest companies in China's paper industry. Yet, most of these companies did not release annual reports or systematic and complete accounting statements. Without consistent disclosure requirements, many of the companies appeared to file detailed annual financial statements only sporadically. Subsidies to and from large SOEs or collectives are also difficult to identify because of accounting practices. For example, the large Chinese state-owned oil companies appear to be reporting government subsidies as profits or revenues (Haley 2009b).

Given the problems associated with getting valid and reliable data from China, this report used data from multiple reliable sources across China, Hong Kong, the United States, Finland, the United Kingdom, and Australia, including Chinese government agencies (such as the NDRC), Chinese officially sponsored think tanks (such as China Economic Information Network), U.S. government agencies (such as the International Trade Administration), international agencies (such as the FAO), international investment houses (such as Deutsche Bank), individual companies (such as Chenming Paper), and industry associations (such as the China National Light Industry Information Center). Data were cross-checked against at least two sources when possible, and when discrepancies arose, the most conservative data were used. Estimates were checked against accounting data provided by individual companies and interviews with managers. As mentioned above, ill-defined data were not used.

Price-gap approach

In cases of low-quality data, analysts commonly adopt the price-gap approach to measure subsidies (World Bank 1997). According to the price-gap approach, subsidies to consumers reduce end-user prices and result in higher consumption levels. End-user prices are compared to reference prices to measure the price gap. The reference price represents the efficient price that would prevail in a market undistorted by subsidies and corresponds to the opportunity cost of the last unit consumed. The reference price is usually the border price adjusted for transport and distribution margins and any country-specific taxes for traded goods, or the long-run marginal costs of production for goods not significantly traded. The approach is designed to capture the net effects of all the different policy instruments that affect a good's price. The price gap can be represented as a dollar value of the subsidy per unit of subsidized good or as a percentage of the reference price.

Several issues and assumptions shape the calculation of subsidies. The estimation of the reference price plays a key role in the calculation of the price gap and therefore in the size of the subsidy. Different reference prices can produce very different subsidy estimates. The choice of exchange rate used to compare domestic and international prices also assumes importance. The use of official exchange rates may give very different results from the use of purchasing power parities (PPP) as end-user prices can differ significantly across countries in non-traded goods (*The Economist* 2007). Multiple prices in one economy (as exists in China) can also affect the estimation of end-user prices. This Briefing Paper used official exchange rates for the years in question; the reference prices were industry-specified world prices for pulp, recovered paper, and coal as indicated by industry practice.

Measurement of variables

This Briefing Paper identifies and measures subsidies to the paper industry in China, specifically to electricity, coal, pulp, recovered paper, as subsidy income reported by companies, and as loan-interest subsidies. The mathematical equations to calculate subsidies follow:

1. Provincial-electricity subsidies (PE_s):

$PE_s = \sum_{yr}^{2009} (Skwh_{yr} (EU_{yr} \times SEU_{yr}))$, where:

PE_s = Total benefits to Chinese paper industry by provinces' electricity subsidies

EU_{yr} = Total electricity usage of Chinese paper industry in each year from 2002 to 2009

SEU_{yr} = Percent of value produced by Chinese paper industry in electricity-subsidizing provinces in each year from 2002 to 2009

$Skwh_{yr}$ = Subsidy rate in each year from 2002 to 2009

And SEU_{yr} is determined by:

$SEU_{yr} = \sum_{yr}^{2009} ((6((TS_{yr} - TSIP_{yr})/Pr) + TSIP_{yr}) /TS_{yr})$, where:[18]

TS = Total paper production in all Chinese provinces producing paper

TSIP = Total paper production in 8 Chinese provinces identified as paying electricity subsidies

Pr = Number of provinces producing paper, less the eight provinces identified as paying electricity subsidies

2. Electricity coal-price-increase subsidy (CPI_s):

$CPI_s = \sum_{yr}^{2009} (S_{yr} (EU_{yr} \times SEU_{yr}))$, where:

CPI_s = Total benefits to Chinese paper industry for coal-price subsidy paid to electricity-generation industry

EU_{yr} = Total electricity usage in each year from 2005 to 2009

SEU_{yr} = Percent of electricity usage by Chinese paper industry in each year from 2005 to 2009

S_{yr} = Coal-price-increase subsidy rate in each year from 2005 to 2009

3. Thermal-coal subsidies (T_{cs}):

$T_{cs} = \sum_{yr}^{2009} ((WPT_{yr} - CPT_{yr}) KT_{yr})$, where:

T_{cs} = Total subsidies paid to Chinese paper industry for coal

WPT_{yr} = World price of thermal coal in each year from 2002 to 2009

CPT_{yr} = Chinese price for thermal coal in each year from 2002 to 2009

KT_{yr} = Ton usage in the Chinese paper industry of thermal coal in each year from 2002 to 2009

4. Coking-coal subsidies (T_{ccs}):

$T_{ccs} = \sum_{yr}^{2009} ((WPC_{yr} - CPC_{yr}) KC_{yr})$, where:

T_{ccs} = Total subsidies paid to Chinese paper industry for coking coal

WPC_{yr} = World price of coking coal in each year from 2002 to 2009

CPC_{yr} = Chinese price for coking coal in each year from 2002 to 2009

KC_{yr} = Ton usage in the Chinese paper industry of coking coal in each year from 2002 to 2009

5. Pulp-subsidies (T_{ps}):

$T_{ps} = \Sigma_{yr}^{2009} ((WPP_{yr} - CPP_{yr}) KP_{yr})$, where:
T_{ps} = Total subsidies paid to Chinese paper industry for pulp
WPP_{yr} = World price of pulp in each year from 2004 to 2009
CPP_{yr} = Chinese price for pulp in each year from 2004 to 2009
KP_{yr} = Ton usage in the Chinese paper industry of pulp in each year from 2004 to 2009

6. Recycled-paper subsidies (T_{occs}):

$T_{occs} = \Sigma_{yr}^{2008} ((WPR_{yr} - CPR_{yr}) KR_{yr})$, where:
T_{occs} = Total subsidies paid to Chinese paper industry for OCC
WPR_{yr} = World price of OCC in each year from 2004 to 2008
CPR_{yr} = Chinese price for OCC in each year from 2004 to 2008
KR_{yr} = Ton usage in the Chinese paper industry of OCC in each year from 2004 to 2008

7. Reported subsidies (T_{rs}):

$T_{rs} = \Sigma_{yr}^{2009} Co_{yr}$, where:
T_{rs} = Total subsidies reported in annual reports of 212 Chinese paper companies from 2002 to 2009
Co_{yr} = Subsidy Income reported in paper companies' annual reports in each year

8. Loan-Interest subsidies (A_{lis}):

A_{lis} = Annual loan-interest subsidy paid to Chinese paper industry from 2002-2009 is US$2.13 billion/8[19]

—The author thanks George Haley for help with gathering data and calculating subsidies.

Endnotes

1. CEIC.
2. Economies of scale primarily refer to operational efficiencies through supply-side changes, such as increasing production for single product types; reductions in unit costs can occur as the scale of facilities or production increases. Economies of scope primarily refer to efficiencies through demand-side changes, such as increasing scope of marketing or distribution for different types of products; synergies can reduce costs in families of products through bundling and other marketing strategies.
3. For RMB to US$ conversions, the author used the official exchange rate in the month or day of the statistical release, or in mid-year if the month and day were not specified.
4. Author's interviews.
5. Author's interviews.
6. Excess capacity refers to a situation in which actual production is less than what is achievable or optimal for firms. For the paper industry, excess capacity indicates that the market demand for paper falls below what companies could potentially supply to the market. Oversupply indicates an excess of supply to markets. In the paper industry, oversupply in some sectors has resulted in depressed prices and/or unsold products as supply has exceeded existing demand.
7. CEIC.
8. Author's interviews.
9. Author's interviews.
10. No literal translation to English exists from the Mandarin, but *guanx*i generally captures concepts of trust and relationship building.
11. 2008 exchange rates.
12. For coverage of China's coal sector, see Melanie, Curtotti, Saunders, Schneider, Fairhead, and Qian (2002) and Melanie and Austin (2006).
13. Among major paper producers, only India has a lower collection rate than China of about 28%.
14. RISI and Macquarie Research.
15. Last revised in November 2007.
16. See Scott (2010) for a general discussion of trade with China and U.S. job losses.
17. Haley (2008, 19-24) identified some of the problems attending the measurement of Chinese subsidies. For a discussion of the informational black hole, see Haley and Tan (1996) and Haley, Haley, and Tan (2009).
18. Six provinces are paying electricity subsidies but have not been specifically identified by the NDRC; 22 paper-producing provinces have not been specifically identified as paying electricity subsidies by the NDRC.
19. The NDRC specified loan-interest subsidies to 13 paper projects out of the 43 announced to receive these subsidies.

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