THROUGH CHINA'S LOOKING GLASS

Subsidies to the Chinese Glass Industry From 2004-08

BY USHA C.V. HALEY

Executive summary

- In 2009, China is the largest producer of glass and glass products, has the greatest number of glass-producing enterprises, and has the largest number of float-glass production lines in the world. Since 2003, glass production in China has more than doubled. Concurrently, production capacity in China has also doubled since 2003 and increased more than three-fold since 2000. This report documents the industry's explosive growth and exports and the government subsidies that have bolstered it from 2004 to 2008.
- From 1987 to 2007, China's glass output has risen, on average, by 18% annually. Along with increasing production, the Chinese glass industry experienced a three-fold increase in exports to the United States from 2000 to 2008; correspondingly, the U.S. trade deficit with China on glass also tripled in the same period. In 2008, China contributed over 31% of global glass production. It has become the largest exporter of flat glass and glass fiber in the world.

TABLE OF CONTENTS
Executive summary1
Introduction2
Industry characteristics and structure4
Analysis of glass supply9
Analysis of glass demand12
Production process and manufacturing costs of
Chinese glass 18
Measuring subsidies to Chinese glass24
Subsidies to China's glass and
glass products industry26
Conclusions and future directions30
Appendix: Definition and
measurement of variables
www.epi.org

- Despite competitive pressures, more production capacity is added annually to China's glass industry, and the
 industry displays enormous excess capacity. The number of new float-glass production lines added annually more
 than doubled from 2000 to 2007.
- China's glass industry enjoys no economies of scale or scope. The industry's sales and profits are dominated by smalland medium-sized enterprises, which are also the fastest growing. The industry also displays geographic fragmentation, with manufacturers in 29 of the 32 provinces. Most of the glass manufacturers run much smaller float-glass
 production lines than those of the five global giants.
- China is the largest consumer of glass in the world, but declines in the real-estate and automobile sectors, combined with enormous excess capacity, have made exports the engine behind the industry's growth. Because of existing and planned production capacity, glass exports from China are expected to increase at least until 2011, far outpacing projected increases in domestic demand.
- Data and calculations in this report reveal that China's glass and glass-products industry received at least \$30.3 billion in subsidies from 2004 to 2008. The subsidies spanned heavy oil, coal, electricity, and soda ash and have been growing steadily in this period, reaching about 35% of gross industrial output value of glass in 2008.
- Data and calculations also reveal that China's flat-glass sector within the industry received approximately \$4.8 billion in subsidies from 2004 to 2008. The subsidies spanned heavy oil, coal, electricity, and soda ash and have been growing steadily in this period.

Introduction

In 2009, China is the largest producer of glass and glass products globally, has the greatest number of glass-producing enterprises, and has the largest number of float-glass production lines in the world. Since 2003, glass production in China has more than doubled. Concurrently, production capacity in China has doubled since 2003 and increased more than three-fold since 2000. This report documents the explosive growth of China's glass and glass products industry and the government subsidies that have bolstered this growth from 2004 to 2008.

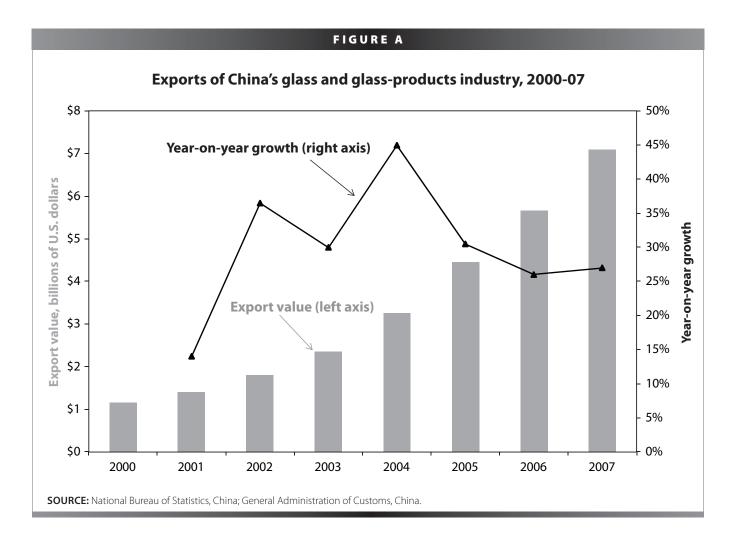
The glass and glass-products industry in China consists of five sectors: flat glass, glass fiber, container glass, glass tableware, and specialty glass. From 1987 to 2007, China's total glass output has risen, on average, by 18% year-on-year.

	Outp	ut and growth of Ch	ninese glass, 2003-07	
	Glass & glass-proc	lucts industry	Flat-glass	sector
	Gross industrial output value (billions of Chinese yuan)	Year-on-year growth (percent)	Gross industrial output value (billions of Chinese yuan)	Year-on-year growth (percent)
003	82.4		20.3	
2004	123.4	49.8%	28.6	40.9%
2005	150.8	22.2	31.9	11.5
006	190.4	26.3	36.1	13.2
2007	258.4	35.7	45.7	26.6

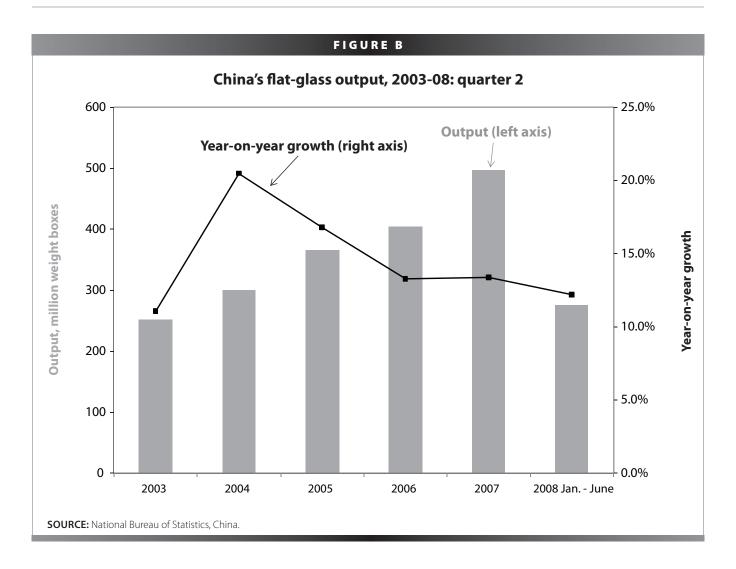
Table 1 describes some of this output and growth for the industry and the flat-glass sector. Through May 2008, output of all glass products (except laminated glass) displayed double-digit year-on-year growth: for example, flat glass in total grew by 12.2%, glass fiber by 43.5%, sealed-insulating glass by 35.9%, tempered glass by 17.8%, laminated glass by 9.8%, household-glass products by 12.8%, and heat-preserving glass receptacles by 19.0%. Sales of glass and glass products jumped 31.0% from the previous year to \$16.5 billion through May 2008, while gross industrial output value reached \$17.1 billion, up 31.3% (China Economic Information Network 2003-09).

Along with increasing production, as **Figure A** shows, the industry experienced a seven-fold increase in exports from 2000 to 2007. China has become the largest exporter of flat glass and glass fiber in the world.

Flat glass comprises a core sector of the glass and glass-products industry in China. **Figure B** traces the growth of flat-glass output in China from 2003 to 2008. In 2007, official statistics indicate that China produced a total of



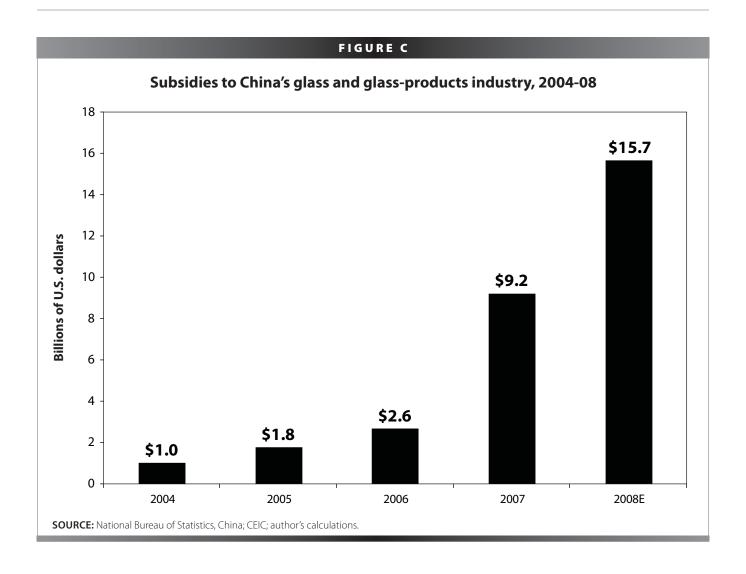
497 million weight boxes¹ of flat glass (National Bureau of Statistics, China 2003-09); however, some private sources have estimated that Chinese flat-glass production may have reached 600 million weight boxes in that year.² Globally, nearly two-thirds of flat-glass production flows into the construction industry and about a quarter flows into the transportation industry for the making of auto-safety glass. The production of mirrors accounts for less than 9% of flat-glass production. In China, too, the construction industry absorbs the bulk of Chinese flat glass, followed by automobiles.



China's strong economic growth together with the introduction of float-glass technology, has contributed to some of the increased glass output since the late 1980s. However, industry characteristics and government policies show that generous government subsidies have bolstered growth as well. Data and calculations in this report reveal that China's glass industry received total subsidies approximating at least \$30.3 billion from 2004 to 2008. **Figure C** traces these subsidies to the glass and glass-products industry, which include subsidies to heavy oil, coal, electricity, and soda ash.

Industry characteristics and structure

By the end of November 2007, 3,430 enterprises, the most in the world, engaged in all aspects of China's glass and glass-products industry (National Bureau of Statistics, China 2003-09). China's glass industry appears to enjoy no economies of scale. Despite the central government's stated policy and ostensible efforts to eliminate inefficient glass production,³ the concentration ratio of China's glass industry remains comparatively low. In November 2007, the sales-revenue concentration ratio of China's top 10 glass and glass-product enterprises was 7.9%, or 1.4 percentage points lower than the same period in the previous year; the profit concentration ratio of the top 10 enterprises was 14.0%. **Table 2** shows the performance of China's glass and glass-products industry by size in 2007. The industry's sales and profits are dominated by medium-sized and small-sized enterprises, which are also the fastest growing in both sales and profits. **Table 3** indicates the ownership of the industry. Private, other/unknown, and foreign-invested enterprises (FIEs) appear the most profitable.



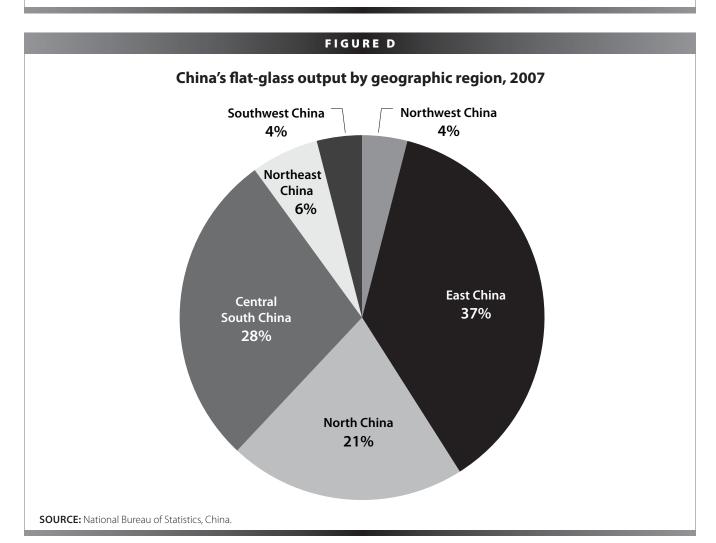
	•		oroducts indust			
		Sales		Profits		
	Actual value	Year-on-year growth	Change in growth over prior year	Actual value	Year-on-year growth	
	(billions of Chinese yuan)	(percent)	(percentage points)	(millions of Chinese yuan)	(millions of Chinese yuan)	
Glass and glass-product enterprises	220	32.8%	2.50	15.6	7.4	
.arge-sized enterprises	24	17.7	-7.50	2.5	1.5	
Medium-sized enterprises	88	31.1	8.10	7.3	3.9	
Small-sized enterprises	108	38.4	-0.50	5.8	2.1	

TABLE 3

Glass and glass-products industry by ownership, 2008

		Sales			ofits
	Total	Year-on-year growth	Change in growth over prior year	Total	Year-on-year growth
	(billions of Chinese yuan)	(percent)	(percentage points)	(millions of Chinese yuan)	(millions of Chinese yuan)
Entire industry	114.6	30.5%	-2.3	7,040	1,576
State business	3.0	11.3	-3.8	43	-14
Regional owned	2.6	19.4	-25.4	150	-3
Co-operative entity	1.1	7.7	-20.5	49	-16
Shareholding	7.9	16.6	-24.1	659	148
Private enterprise	44.5	40.1	0.8	2,780	890
Foreign funded	33.1	24.7	-2.0	2,353	237
Other	22.4	32.9	1.2	1,005	334

SOURCE: China Economic Information Network.

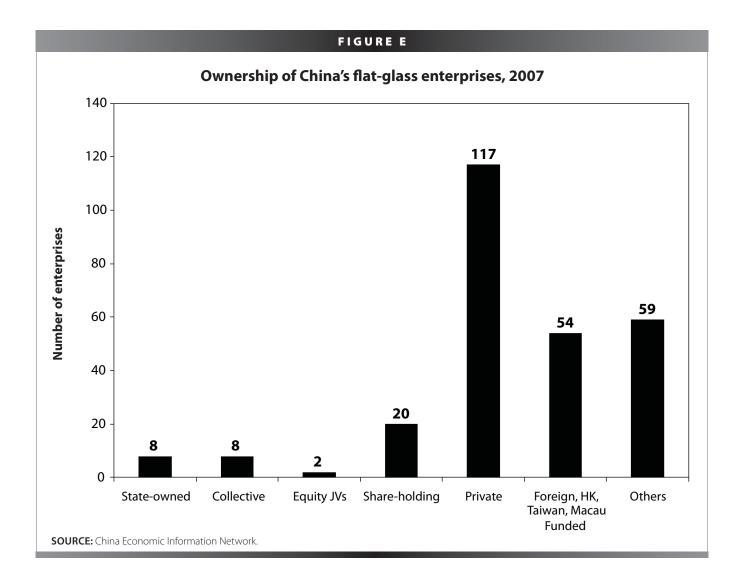


The industry is geographically fragmented, as well. As **Table 4** indicates, flat-glass production in 2007 occurs throughout China, with enterprises operating in 29 of its 32 provinces, autonomous regions, and municipalities. In June 2008, Hebei, Guangdong, Jiangsu, Shandong, and Zhejiang produce the most glass with the first three provinces contributing over 40% of China's total flat-glass output. As **Figure D** shows, the industry appears to enjoy no distributional advantages, and spans North, East, and Central South China, with fewer enterprises in the Northeast, Southwest, and Northwest.

China has 268 flat-glass manufacturers (China Economic Information Network 2003-09), more than any other country in the world. Yet, just as in the industry as a whole, 96% of China's flat-glass manufacturers operate small and

TABLE 4								
Regional flat-glass production in China, 2007								
	Gross industrial output	Industrial value-added						
District	(millions of Chinese yuan)	(millions of Chinese yuan)	Number of employees					
National	45,591	12,761	120,203					
Beijing	161	28	406					
Tianjin	463	105	1,168					
Hebei	5,867	1,559	21,758					
Shanxi	300	69	1,060					
Inner Mongolia	1,166	413	3,140					
Liaoning	1,415	384	4,306					
Jilin	822	295	1,327					
Heilongjiang	296	92	1,478					
Shanghai	901	196	2,913					
Jiangsu	6,988	1,648	12,920					
Zhejiang	1,293	297	3,887					
Anhui	609	106	2,123					
Fujian	2,335	1,052	2,980					
Jiangxi	47	19	170					
Shandong	5,615	1,173	13,090					
Henan	4,874	1,387	17,501					
Hubei	1,945	589	5,060					
Hunan	1,022	331	2,967					
Guangdong	6,295	1,911	8,905					
Guangxi	407	88	1,126					
Hainan	118	40	500					
Chongqing	164	46	1,210					
Sichuan	1,333	565	4,241					
Yunnan	232	24	1,179					
Shaanxi	544	189	2,338					
Gansu	370	112	1,598					
Qinghai	49	23	318					
Ningxia	32	9	294					
Xinjiang	30	9	240					

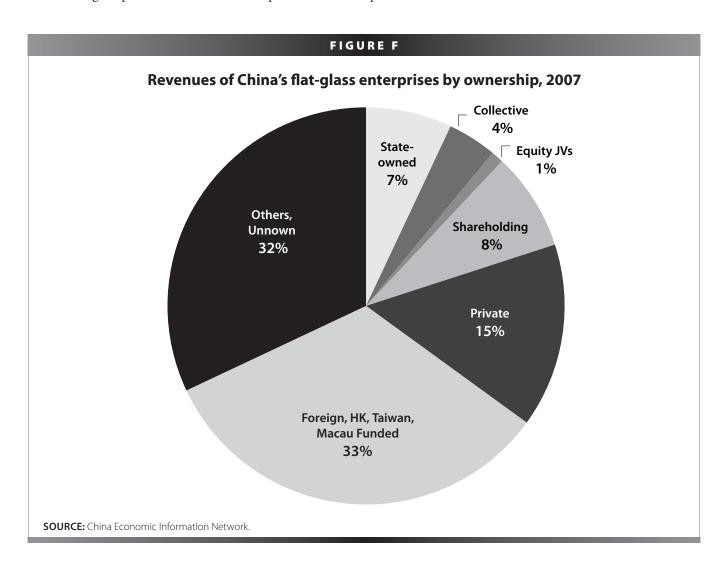
medium-sized facilities, as Table 4 indicates. These facilities also appear the most vibrant. Indeed, small enterprises experienced 65% year-on-year growth in sales revenues, as opposed to large ones, mostly Joint Ventures (JVs) or FIEs that experienced about 9% growth. Most of China's glass producers also run much smaller float-glass production lines than those operated by the big five global glass giants (Asahi Glass, Pilkington, PPG, Saint Gobain, and Guardian Industries). Only 23% of China's production lines have daily output of more than 500 metric tons compared with the big five's production lines of more than 700-800 metric tons per day. Currently, 64% of China's glass manufacturers have production runs of between 300 and 400 metric tons a day, and 13% have runs of less than 300 metric tons per day. The majority of glass producers in China operate at the low to medium end of the spectrum.



Since 2001, China has also become the largest flat-glass producer in the world. The flat-glass sector exhibits the same ownership breakdown as the industry. As **Figure E** indicates, most of China's flat-glass manufacturers are privately owned. **Figure F** shows that FIEs and those of unknown ownership extract the bulk of revenue. Collectives and state-owned enterprises (SOEs) appear to have lower revenues than their competitors.

Analysis of glass supply

This section looks at the growth of Chinese glass production and the building of excess capacity. It also traces the effects of Chinese glass production on Chinese exports and U.S. imports.



Production capacity

In 2008, China's glass industry contributed over 31% of global-glass production. The country has the greatest number of float-glass production lines and the largest production capacity for float glass in the world. **Figure G** outlines the total number of float-glass production lines and production capacity in China from 2000 to 2007. Production capacity of glass in China has more than doubled since 2003 and increased three-fold since 2000. As Figure B showed, China produced 497 million weight boxes of flat glass in 2007, an increase of 13% from the previous year. China's output of flat glass more than doubled from 2003 to 2008. The growth rate of glass production shows no sign of abating, increasing the demand for raw materials. Indeed, the production of pure alkali (a key input into glass production) increased by 11% from January to October 2007, while production of glass increased by more than 18%, significantly higher than that of upstream industries (National Bureau of Statistics, China 2003-09).

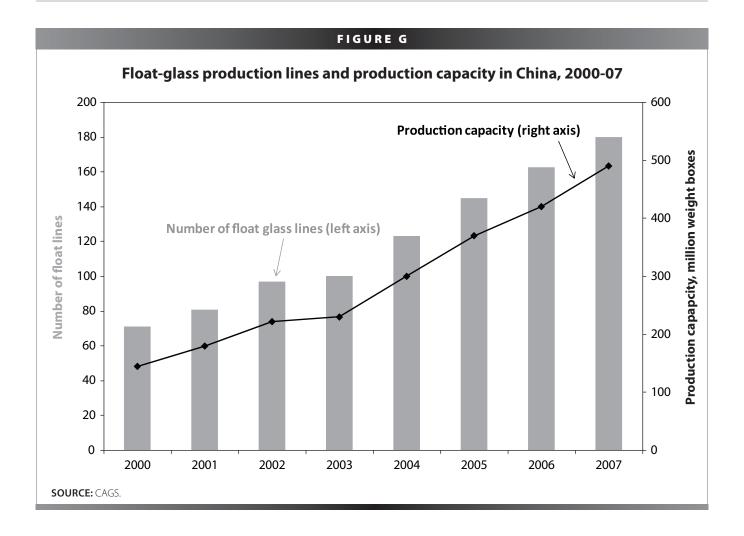
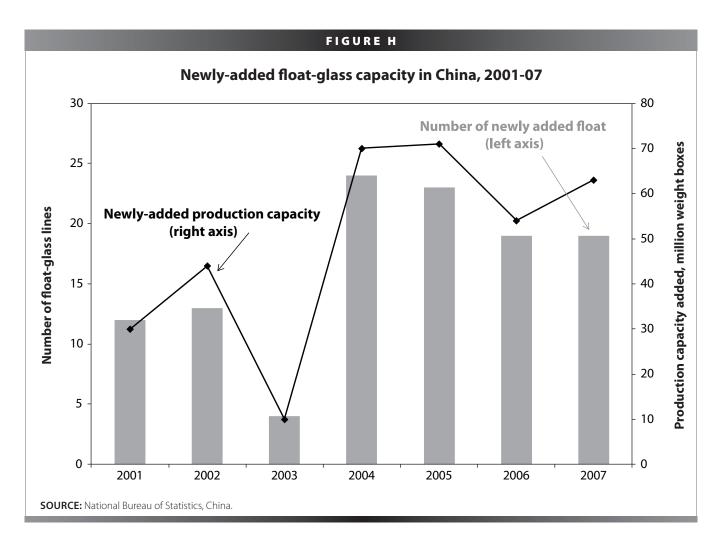


Figure H shows that despite competitive pressures, more production capacity is added annually to China's glass industry, at least quadrupling annually the production capacity added in 2003. Indeed in 2007, 19 float-glass production lines were added, which brought 62.6 million weight boxes of newly increased production capacity. Over 40 production lines were under construction or planned for construction in 2008 and 2009 contributing to the increased capacity and even more fierce price competition. As the next section elaborates, the supply of medium and low-grade float glass greatly exceeds demand in China, while the supply of high-grade float glass sometimes falls short of demand. Recently, with the central government's encouragement, the number of production lines with larger capacity and higher quality has increased, including CSG's two lines of high-grade float glass with a daily melting capacity of 6 million and 7 million tons respectively; Shanghai Yaohua Pilkington Glass Company's line for Changshu ultra-clear and rolling glass; and, Xinyi Group's line for Dongguan high-grade float glass with a daily melting capacity of 9 million tons. Despite these efforts, the great bulk of new lines continue to emphasize the production of lower-grade float glass.

Overcapacity and overheated growth constitute major forces exerting downward price pressures on China's glass-manufacturing industry. Without the ability to extract significant economies of scale, and because of oversupply, margins have been squeezed. Operating data of key enterprises in China's glass industry from January to April 2008 showed that cumulative total profits declined 7% year-on-year, with profit margins falling to 15% from 42%. A significant proportion of these enterprises have experienced on-the-book losses, although the share of firms reporting

losses has declined. For example, by the end of November 2007, 554 of the total 3,430 enterprises engaged in China's glass industry, making up 16% of the total, suffered economic losses, lower than the 18% in the corresponding period in 2006. The economic losses for the 554 companies in 2007 amounted to 1.7 billion yuan, down 40% from the corresponding period of the previous year. Government subsidies and transfers have contributed to bolstering profits and



to continuing growth in sales (China Economic Information Network 2003-09). In May 2008, glass prices continued to decline, while the price of the major inputs into glass, pure alkali and heavy oil, continued to rise.

Exports and imports

China's increased glass production has transformed it into an export juggernaut. In the first six months of 2008, exports of Chinese glass and glass products exceeded \$4 billion, paralleling the growth rate of the industry (China Economic Information Network 2003-09). The results hold across sectors. For example, Chinese exports of flat glass have far outstripped its imports, as **Figure I** shows. In 2007, China exported about 16% of its total flat-glass production. Because of existing and planned production capacity, glass exports from China are expected to continue to increase at least until 2011, outpacing projected increases in demand and increasing its trade surplus.

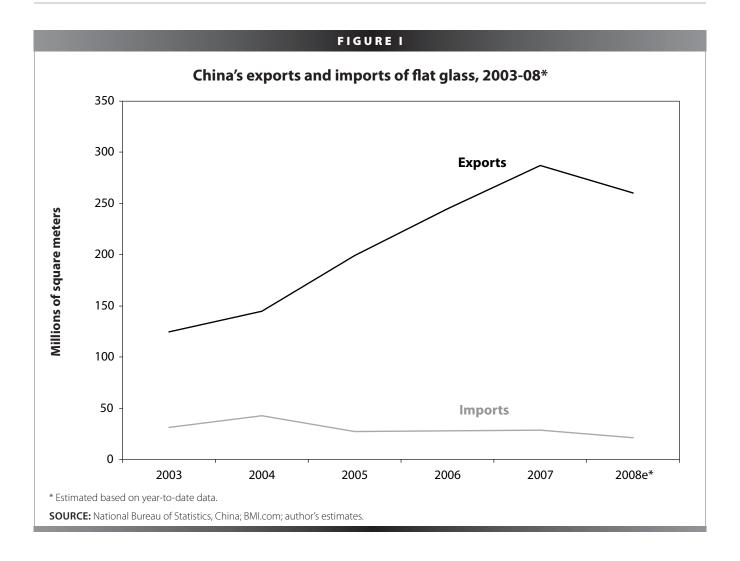
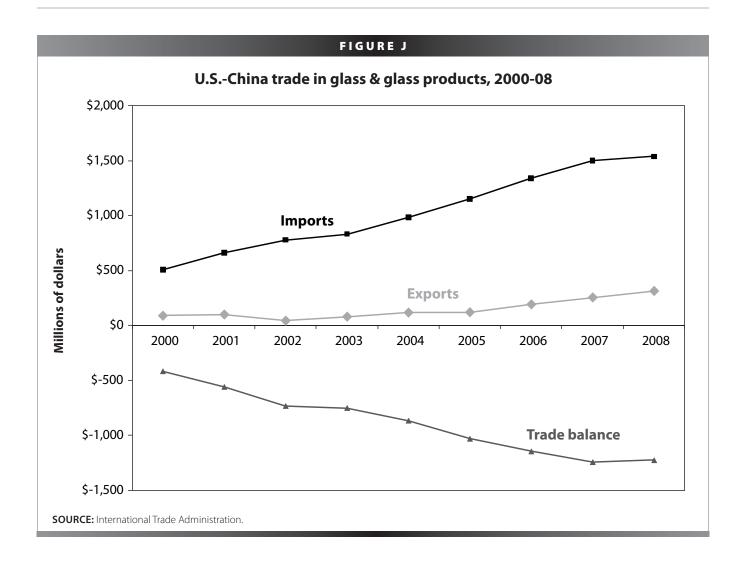


Figure J shows U.S. exports and imports of glass and glass products from China from 2000-08; both have increased three-fold in that period. However, U.S. exports of glass and glass products to China have remained at a comparatively low level. Consequently, as Figure J also shows, the U.S. trade deficit with China in glass and glass products has increased dramatically from 2000-08.

Starting from July 1, 2007, China adjusted tax rebates for the exports of glass and glass products down to 5% from 13%. The drop in export-tax rebates forced some enterprises to raise the prices of exports, to some extent weakening their competitive positions as low-cost suppliers. However, China's automobile-glass exports seemed unaffected in 2007. For instance, Fuyao Glass's revenues from auto glass reached 3.6 billion yuan in 2007, up 23% from the previous year. Forty-one percent of Fuyao's revenues came through exports. Its exports have increased by 26% year-on-year, and the company's original equipment manufacturer (OEM) market grew 130%. Meanwhile, as Figure J shows, the U.S. trade deficit with China in glass and glass products has remained relatively flat from 2007-08.

Analysis of glass demand

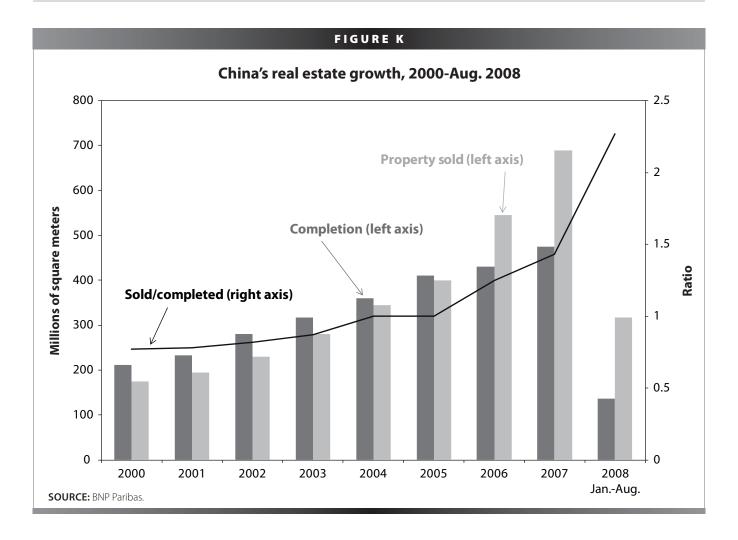
China is the largest consumer of glass in the world, accounting for 33% of global demand. Fabricated flat glass encompasses insulating glass, tempered glass, laminated glass, mirrors, and other specialty products, and accounted for over 20% of overall Chinese flat-glass demand in volume in 2007.⁶ Though total product demand has risen nearly three-fold over the past 10 years, intense competition exists in the flat-glass sector. Table 2 and **Table 5** have shown



Performance of China's flat-glass enterprises by size, Jan.-Nov. 2007

	Sales			Cumulative profits		
			Year-on-year growth		Year-on-year growth	
	Number of enterprises	(billions of Chinese yuan)	(percent)	(billions of Chinese yuan)	(billions of Chinese yuan)	
Large-sized enterprises	10	10.4	8.6%	0.6	-0.6	
Medium-sized enterprises	73	22.0	33.1	1.6	-0.5	
Small-Sized enterprises	185	8.8	65.0	0.4	0.0	
Total	268	41.2	31.1	2.6	-1.1	

SOURCE: China Economic Information Network.



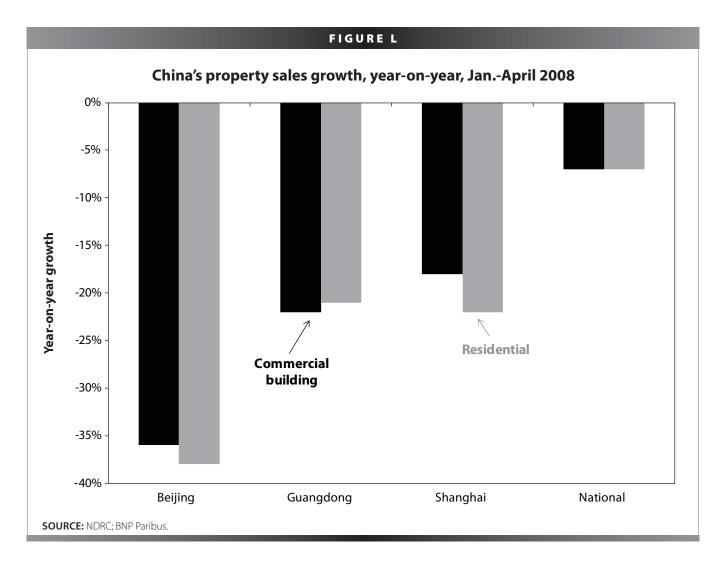
that most Chinese manufacturers are small- and medium-sized enterprises that cannot extract economies of scale and scope. Consequently, many flat-glass products constitute commodities, with price the most-critical selection factor. The existence of relatively few markets further heightens competitive pressures, as many products compete for use in a limited number of applications. In addition, numerous new flat-glass manufacturers have begun operations in recent years, making product differentiation more difficult. The construction and automobile industries serve as the largest consumers of Chinese flat glass and an updated sectoral analysis of each follows. The section concludes with a brief survey of the rapid growth of the Chinese glass-fiber sector.

Construction

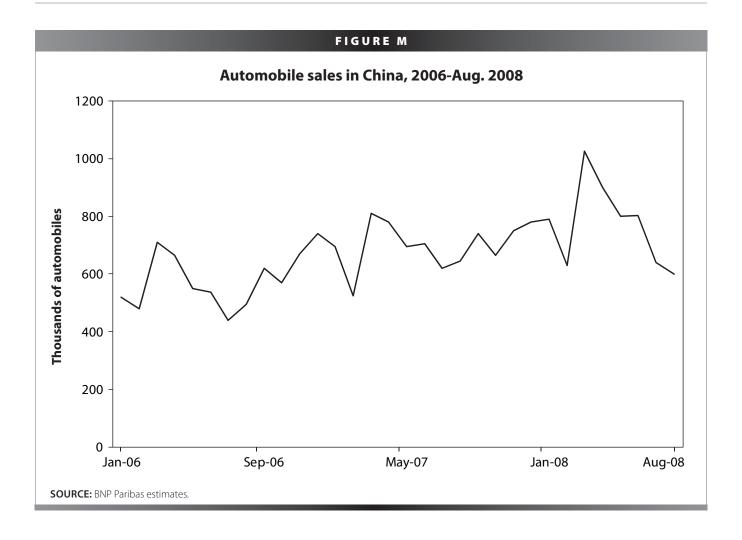
The architectural market has historically constituted the largest outlet for flat glass in China, accounting for 86% of total demand by area in 2006 and 80% in 2007. Demand for flat glass used in residential-building applications totaled 900 million square meters in 2006, making up over 70% of the total architectural market. Over the past decade, residential demand has increased 8.7% per year, rising in line with residential-building-construction expenditures (see **Figure K**). Slow growth in new building construction⁷ restrained market gains during this period. The residential market encompasses both new construction and improvements and repairs of single-family homes and apartment buildings. Moderated growth in the overall population and in households should act as a counterbalance, restraining residential flat-glass market gains through 2011. New construction applications accounted for just over 75% of residential flat-glass demand in China in 2006: the long-lasting properties of flat glass results in a low level of replacement

demand. In addition, Chinese consumers are much less likely to replace still-functional window glass for style, energy, or safety considerations.

However, as **Figure L** shows, like much of the world, China is currently suffering a real estate decline. From July 2007 to July 2008, national statistics showed single-digit growth in the average price of commercial and residential real estate. In contrast, real estate brokers have indicated that prices have fallen from peaks reached earlier in 2008, while the number of transactions has plunged. Volumes first dropped precipitously in southeastern China, and then the decline spread across the country. With few buyers, sellers cut prices for residential and commercial real estate. In some cities, prices dropped by 10% to 40%. In other parts of the country, transactions fell, but prices have only started to follow. For instance, the number of home sales plunged by two-thirds in Harbin in the northeast, though prices fell as little as 4% from the same period last year. A wealth effect has also occurred: many investors from China have their cash tied up in the mainland's stock market and real estate, so they would rather take a loss now. The share



prices of real-estate developers have plunged. For example, Vanke, the country's biggest publicly traded developer, was down by 35% in August 2008 from a year earlier. Several analysts believe that the real estate downturn will create a matching downturn in the construction sector and contribute to enormous excess inventory in Chinese glass.

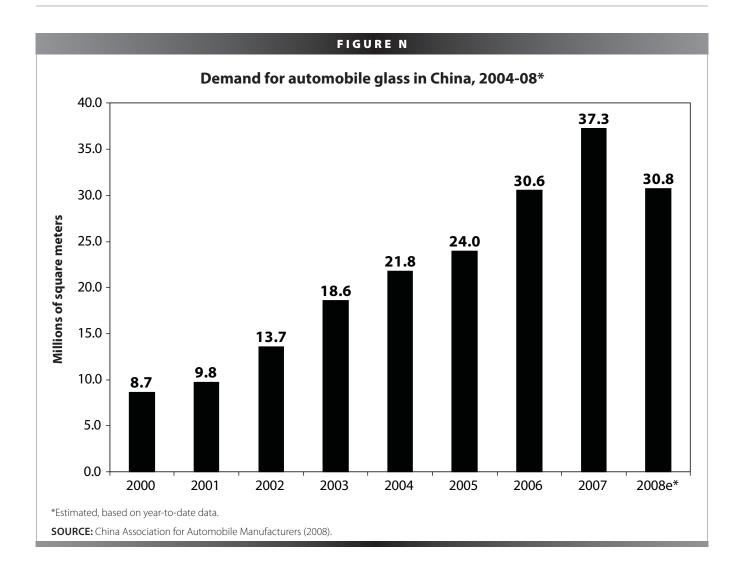


Automobiles

Float glass constitutes the major raw material for automobile-glass production and this sector is the second-largest consumer for Chinese flat glass. China has over 130 auto makers and they serve as customers of automobile-glass makers. The average automobile uses over 4.2 square meters of glass. The automobile-glass-consumer market consists of the matching OEM market and the fittings-repair aftermarket. Chinese enterprises have competed domestically on the matching market and globally on the international fittings-repair market.

After falling off in 2005, Figure M shows that China's automobile market grew steadily for a couple of years: market demand for automobiles exceeded 8 million units in 2007, about 18% higher than in 2006. However, in 2008, the Chinese automobile market saw fierce competition and price cutting, despite rapidly rising raw-material prices. The China Association of Automobile Manufacturers (CAAM) reported that in 2008, the Chinese automobile market had its worst year in a decade, with annual passenger car sales rising only 7.3%. In January 2009, year-on-year sales of cars and light commercial vehicles had fallen 7.7% (China Association of Automobile Manufacturers 2008-09). The Chinese government acted with success to stimulate car purchases in January 2009 through tax cuts and cash incentives (Waldmeir 2009a). Chinese car sales rose 90% year-on-year in August 2009 amid signs that tax cuts and subsidies from Beijing could propel China to record sales of 12 million vehicles this year (Waldmeir 2009b).

China's automobile glass industry is highly consolidated; three companies account for more than 80% of total market share in China. Chinese automobile glass makers' expansions have been on the upstream raw-material side with

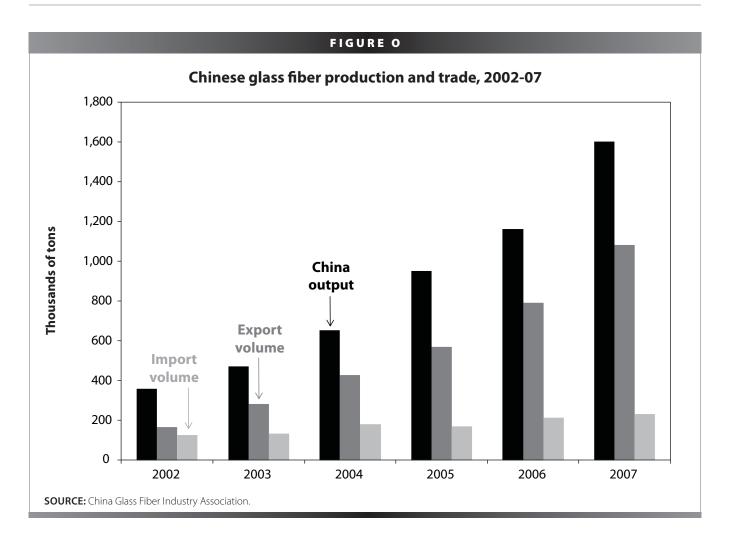


most having plans to build float-glass lines to improve raw material supply. On the end-product line, capacity expansion has been relatively modest. **Figure N** describes the steady growth rate of automobile-glass demand in China. In 2008, China had over 200 automobile-glass manufacturers. Only a small proportion of these automobile-glass manufacturers engaged in large-scale production; most were small and also had poor product quality. Chinese glass producers only passed ISO9002 Authentication; yet, the more rigorous QS9000 Authentication and VDA Authentication constitute the ISO9000 quality-system standards for the global auto-manufacturing industry.

In 2005, China exported about 650,000 square meters of automobile glass to the United States with an average selling price of \$31.8 per square meter. Export volume rose to 5.4 million square meters in 2007, but the average selling price dropped to \$18.5 per square meter (China Association of Automobile Manufacturers 2008-09). Overcapacity in the auto industry will result in further downward pressure on vehicle-component prices, including automotive glass.⁸

Glass fiber

Starting from a fairly low base, in 2007, China became the largest exporter of glass fiber in the world and most of its production is exported. **Figure O** outlines the growth of glass-fiber production and exports. In 2007, China exported 1.1 million tons of glass fiber or 68% of its gross production and 29% of global glass-fiber exports. China produced

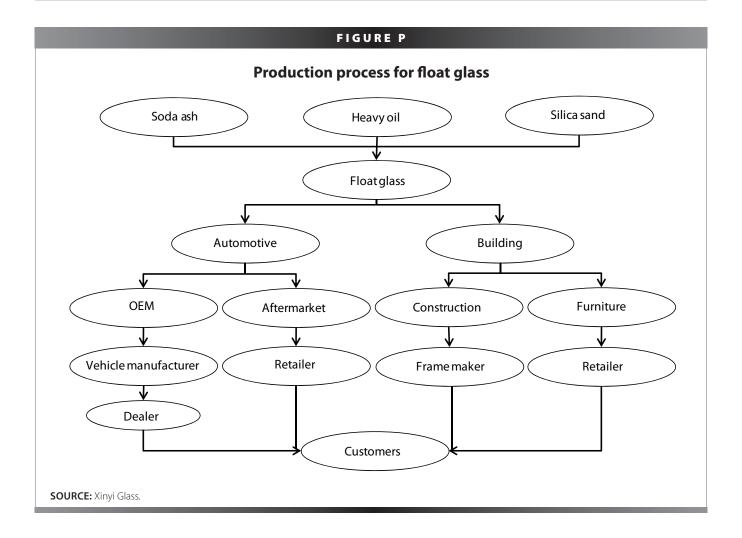


about 1.6 million tons of glass fiber in 2007, up 38% year-on-year. From January to April 2008, the production of glass fiber accelerated to 476,000 tons, up 42% year-on-year; and, exports increased by 62%, compared to the same period in 2007.

Production process and manufacturing costs of Chinese glass

All glass production begins with mixing and heating the primary raw materials. The molten glass is floated over a bath of molten tin, which has a temperature of more than 1,000 degrees Celsius. Glass and tin do not mix, and the interface between the two gives the glass a perfectly flat surface. The sheet then passes onto an annealing lehr, where the glass (cooled to about 600 degrees Celsius) is annealed and fire finished. Finally, the glass is allowed to cool for cutting or finishing. Manufacturers have used this float-glass process since the 1980s, and it constitutes the dominant glass-production method in use today. From this basic float-glass production process, manufacturers can create other products either by adding other materials to the melt, or by treating the resulting glass with colorants, silver, copper, or metal oxides either on or off line. Heavy oil, soda ash, and silica sand form the primary raw materials for the production of glass. **Figure P** describes the production process for float glass.

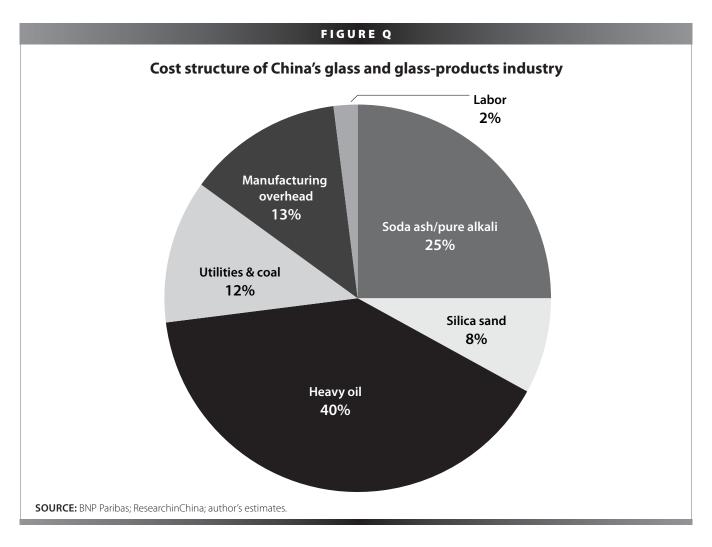
Drawing on case studies, competitor analysis, and independent research, **Figure Q** indicates the cost structure of China's glass and glass-products industry. Heavy oil and soda ash contribute to 65% of the costs of manufacturing Chinese glass and glass products. Utilities and coal contribute another 12% to the cost. Labor contributes only 2% of the costs of manufacturing glass in China.



Heavy oil

China's two oil giants, China Petroleum and Chemical Corporation (Sinopec) and China National Petroleum Corporation (CNPC), receive subsidies for their operations from China's National Development and Reform Commission (NDRC) and the Ministry of Finance. Specifically, while world-market prices dictate crude prices in China, the administration sets oil-product prices and also issues rebates. Theoretically, oil-product prices in China are pegged to the weighted average of the Brent, Dubai, and Minas crude-oil prices, taking into account processing costs, distribution costs, and refineries' profit margins. However, because of inflation concerns, rarely does the NDRC permit domestic oil's product prices to move with the fluctuations of international prices. Domestic oil's product prices lag behind international prices, and domestic refineries dependent on imported feedstock operate at a loss when international crude prices surge. All of China's crude imports—more than 3.3 million barrels a day as China imports about half its oil—are processed by the refineries of Sinopec and CNPC, with Sinopec handling 80% of the total (Bo 2007; Stanway 2009). Chinese oil demand is rising at about 8% annually; virtually every incremental barrel of Chinese oil demand must be met by imports. In 2009, China is the biggest single contributor to the annual increase in global-oil demand.

In 2007, Beijing disclosed a total of 60 billion yuan in oil subsidies of which about 5 billion yuan went to the main refiner, Sinopec. This amounted to 1.2% of government expenditure, 0.2% of GDP, or about one-third of total taxes paid by the state-run oil companies. In the first quarter of 2008, Sinopec got 7 billion yuan to compensate for first-quarter refining losses. Beginning in April 2008, the government also began rebating 75% of the value-added tax paid on imports of crude oil by Sinopec and PetroChina's parent company CNPC (the VAT rate on crude imports was 17%).



This translated into a disclosed subsidy payment of 7 billion yuan for April 2008; total, recorded refiner subsidies probably exceeded 70 billion yuan in 2008. Adding in user subsidies (which should not change much given that retail prices are fixed), Beijing has probably paid out over at least 130 billion yuan in subsidies in 2008 or about \$20 billion, more than double the 2007 figure. The gross cost approximates 2.1% of budgeted 2008 government expenditure.⁹

Cost of good	ds sold: Heavy	-oil sensit	ivity analy	sis for Xin	yi Glass	
Growth in heavy-oil prices	0%	1%	5%	10%	15%	20%
Margins (percent):						
Gross	34.5%	34.3%	33.3%	32.0%	30.8%	29.5%
Vet	20.5	20.2	19.3	18.1	16.9	15.7
Margin changes (percentage points):						
Gross		-0.2	-1.0	-1.2	-1.2	-1.2
Vet		-0.3	-0.9	-1.2	-1.2	-1.2

A Cost of Goods Sensitivity analysis was done for Xinyi Glass, one of the largest exporters of automobile glass in China, and the most profitable glass enterprise in China. Despite its value-added products, prices of raw materials remained one of the major uncertainties for Xinyi's earnings outlook. Its vertical integration into upstream float-glass production would not shelter it from upstream costs such as heavy oil, soda ash, and silica sand. A major investment company estimated that a 1% increase in the heavy-oil price could lead to a 0.2 and 0.3 percentage-point decrease in gross margin and net margin, respectively, for Xinyi Glass (see **Table 6**). The cost of heavy oil has shot up sharply from 2005.

Coal

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. Over the last two decades, the amount of coal produced for other demand has grown. 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.¹⁰

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. In 2006, China consumed 2.4 billion tons of coal, nearly twice the amount consumed just six years ago. Over 75% of the demand growth in recent years has come from the power sector, as electricity demand boomed and alternative fuel sources (hydro, natural gas, wind, and nuclear) for generating that electricity failed to keep pace. Of the 50% of coal not consumed by the power sector, the majority sells directly to industry for use in boilers, coking ovens, and on-site ("inside the fence") power generation. Household coal consumption, which accounted for 20% of total demand in 1985, dropped to 4% as China's residents move into homes equipped with gas and electricity for cooking and heating (Haley 2008).

Electricity

Like the coal used to generate it, manufacturing industries also consume the majority of the electricity produced in China. Electricity prices for Chinese industry appear high at first glance. However, interviews with industry analysts indicate that many companies do not bear the full costs indicated by national average figures from the National Bureau of Statistics. Subsidies or "price adjustments" permeate the system, and some of these price adjustments occasionally become declassified. The NDRC sets electricity tariffs province by province based on the recommendations of local pricing bureaus that answer to local officials. Local social and economic concerns often impede the NDRC's efforts to rationalize energy pricing and to reduce overall energy consumption. The provinces' governments that support their inefficient companies have resisted the NDRC's recent efforts to raise electricity prices and nonpayment has become an important issue. 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). Complex and opaque end-user pricing and transmission costs obfuscate the allocation of rents across the electricity value chain. Because this report relied solely on published prices and the NDRC's disclosures on provinces that had subsidized their steel industries, the subsidies to electricity are probably underrepresented.

Reflecting the dominance of coal in China's electricity fuel mix, substantial increases in electricity output have increased demand for thermal coal. Coal consumption by the electricity sector increased at an average annual rate of around 21% between 2002 and 2004 following an increase of 5.6% in 2001. Many coal and power-generation companies have public listings, but extensive government control and ownership remain in both industries. The government is increasingly linking electricity prices with coal costs, and electricity consumption with the introduction of more transparent pricing mechanisms. For example, two-part tariff rates have been introduced to curb electricity consumption by

energy-intensive industries, and retail electricity charges have also risen recently to reflect higher coal prices (Australian Bureau of Agricultural and Research Economics 2008-09).

In mid-2004, the price of electricity was increased on average by 0.08 cents per kWh. A further increase of 0.27 cents per kWh was introduced in the east, north, central, and southern grids to pass on additional costs of transmission. In 2005, the State Council approved the implementation of a new pricing mechanism to link electricity charges to coal costs. An increase in the coal price is passed on to electricity consumers when the average coal price changes by more than 5% over six months. If the change in the average coal price is less than 5% in six months, the percentage-price change carries over to the next six months. However, as **Table 7** reveals, the central government simultaneously offers a subsidy to the electricity-generation industry, in effect since 2005, to offset the higher electricity prices; this subsidy is then passed on to electricity's customers, including the glass industry (*Interfax China Energy Report Weekly* 2006). The fuel-input adjustment in 2005, and the attendant increase in subsidies, responded to a significant increase in coal prices

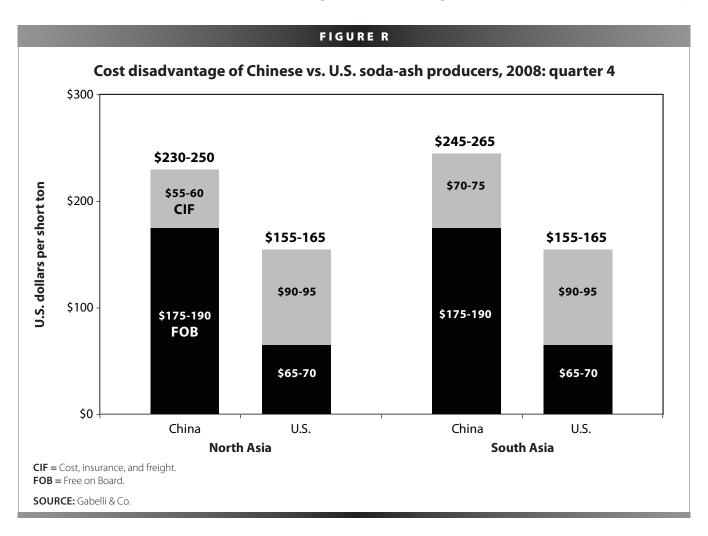
Some subsidies to electricity in China	
	Price changes and subsidies (U.S. cents per kilowatt hour
Average regional increases in sales prices	
Eastern China	0.22
Central China	0.36
Southern China	0.37
Northeastern China	0.17
Average increase (all regions)	0.3
Subsidies for state government projects	
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

in 2004 (Institute of Energy Economics 2006). In June 2006, electricity charges were increased in response to higher coal costs as well as additional adjustments for higher construction costs of new generation and transmission projects, relocation compensation, and support for the development of renewable-energy projects. Simultaneously, a subsidy to industry was added to "adjust" for the increased prices (Haley 2008).

Soda ash

China has low-grade soda ash and relies primarily on synthetic soda ash. Chinese soda-ash consumption was approximately 7 million tons in 2008, and the glass and glass-product industry was the major consumer of this product. About 30%

of soda ash went into container glass, and another 15% went into flat glass. A large disconnect exists between the price of Chinese synthetic soda ash and the export price of North American soda ash. In fact, the price of North American soda ash sold into North and South Asia in December 2008 was below the average cash cost of the Chinese synthetic product (see **Figure R**). China has more than 60-soda ash manufacturers, mainly located along the eastern coastal regions. The top five manufacturers account for more than 40% of domestic production and the top 10 manufacturers for more than 50%. Only



Cost of goods sold: Soda-ash sensitivity analysis for Xinyi Glass							
Margins (percent):							
Gross	34.5%	34.3%	34.0%	33.2%	32.0%	30.4%	
Net	20.5	20.3	19.9	19.2	18.1	16.6	
Margin changes (percentage points):							
Gross		-0.2	-0.4	-0.8	-1.2	-1.6	
Net		-0.2	-0.4	-0.7	-1.1	-1.5	
SOURCE: Xinyi Glass; BNP Paribas.							

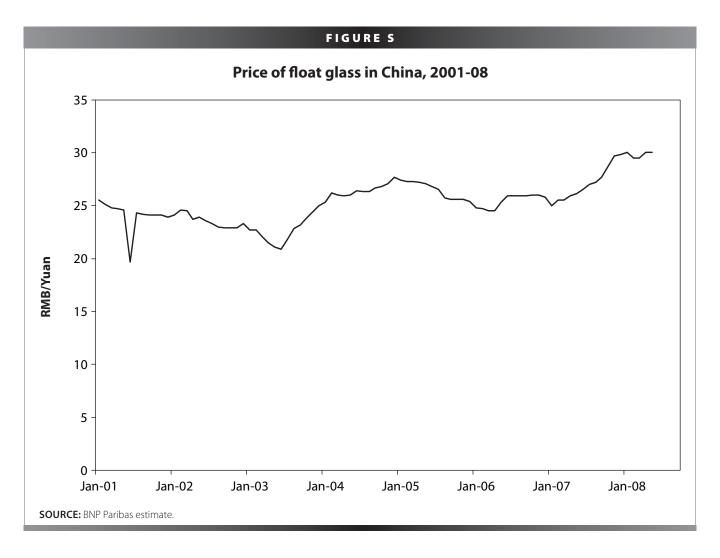
one soda-ash producer was added between 2005 and 2008 (Qinghai Soda Ash, with annual production capacity of 900,000 metric tons). Though the soda-ash price remained relatively stable during 2006, increasing demand in downstream industries such as the production of float glass pushed the price up from 2007. In 2008, 1.3 million tons of Chinese synthetic soda-ash capacity was mothballed, and projects accounting for over 3 million tons of new Chinese synthetic capacity were deferred or canceled, adding to an already tight supply/demand balance.¹¹

Following up on the previous COGS sensitivity analysis for heavy oil, a major investment company estimated that a 1% increase in the price of soda ash could lead to a 0.2 percentage-point decrease in both gross margin and net margin, respectively for Xinyi Glass (see **Table 8**).

Raw-material prices rose steeply in early 2008. Data from the Pearl River delta regions show that the soda-ash price rose by 50% to 2,400 yuan per metric ton and the heavy-oil price rose by 30% to 4,500 yuan per metric ton. These price increases, combined with increases in silica sand prices and transportation costs, pushed the glass-manufacturing cost for each weight box up by 20% to 30% in the first quarter of 2008. Despite the sharp increases in raw material prices, as **Figure S** shows, the price of float glass has not increased appreciably in China since 2001.

Measuring subsidies to Chinese glass¹²

The World Trade Organization (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 report uses the WTO definition.

Subsidies exist in all industries that the Chinese state and provincial governments consider important to maintain economic stability and contribute towards strategic goals. 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).

Data

Institutional reasons (including poor infrastructure to gather and to disseminate data) and strategic reasons (such as using data to create an informational black hole to confuse competitors) hinder the collection of high-quality data in China.¹³ Because of limitations attending the quality, completeness, and quantity of industry-level data, ¹⁴ the analysis began with subsidies to the flat-glass sector of the Chinese glass industry, which were then extended to the entire Chinese glass and glass-products industry. Despite efforts to close inefficient and small plants, policy makers within China generally do not perceive the glass industry as a strategically important or pillar industry. Consequently, less systematic and comprehensive operational data exist for glass than for pillar industries such as steel. Also, as Table 2 has shown, two-thirds of the sales revenues in glass come from small and medium-sized enterprises whose operations are difficult to track in China. Only the 10 largest enterprises release systematic accounting data. Indeed, as Table 3 and Figure F have shown, about a third of revenues come from "unknown or other" enterprises. Because it serves as a major supplier to strategic industries such as construction and automobiles, the flat-glass sector provided the most complete data and also data from a variety of sources. The latter factor was important because official surveys of the industry were found to be flawed. For example, data approved by the National Bureau of Statistics listed thousands of employees in the flat-glass sector, and hundreds of thousands of yuan of gross industrial output of flat glass for 11 provinces—with zero companies. The aggregate data were cross-checked with semi-independent industrial sources and the data on the specific numbers of companies in each province were not used.

Researchers and analysts have also found subsidies to coal and electricity very difficult to measure because of the problems with the quality of energy statistics¹⁵ as well as the quality of accounting data. With reference to China, the country'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. 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.

Lack of regular and rigorous industry surveys also cloud other official statistics on glass. China's official statistics are riddled with inconsistencies. For example, the numbers reported on growth in both GDP and fixed investment, as well as between investment and savings are incompatible. Services are poorly covered in national account measures and consumption of all kinds, including industrial consumption, is probably grossly underestimated.¹⁹

Accounting data in China are particularly opaque. Despite Beijing's avowed 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.²⁰

Subsidies from and to large state-owned enterprises or collectives are particularly 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. In 2008, Petrochina announced that its profits for the year were mostly from government subsidies and import-tax rebates (Interfax 2008b). Similarly, in March 2008, Sinopec announced that it would receive a government subsidy of \$1.74 billion. Some of the subsidy (\$693.6 million) would be included as part of the company's revenues for 2007; the rest of the subsidy (\$1.05 billion) would be counted as revenue for the first quarter of 2008 (Interfax 2008a).

Given the monumental problems associated with getting valid and reliable data from China, this report used data from multiple reliable sources across China, the United States, and Hong Kong, including Chinese government agencies (such as the National Development and Reform Commission), 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 International Energy Agency), international investment houses (such as BNP Paribas), individual companies (such as Xinyi Glass), and industry associations (such as the China Association for Automobile Manufacturers). Data were cross-checked across 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 previously, ill-defined data were discarded.

In cases of low-quality data, analysts commonly adopt the price-gap approach to measure subsidies (World Bank 1997; International Energy Agency 1999). According to the price-gap approach, subsidies to consumers lower 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 taken as the border price adjusted for transport and distribution margins and any country-specific taxes in the case of traded goods or the long-run marginal cost of production in the case of goods that are 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 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. Multiple prices in one economy (as exists in China) can also affect the estimation of end-user prices. This report used official exchange rates for the years in question; the reference prices were industry-specified world prices for heavy oil, coal, and soda ash as indicated by industry practice.

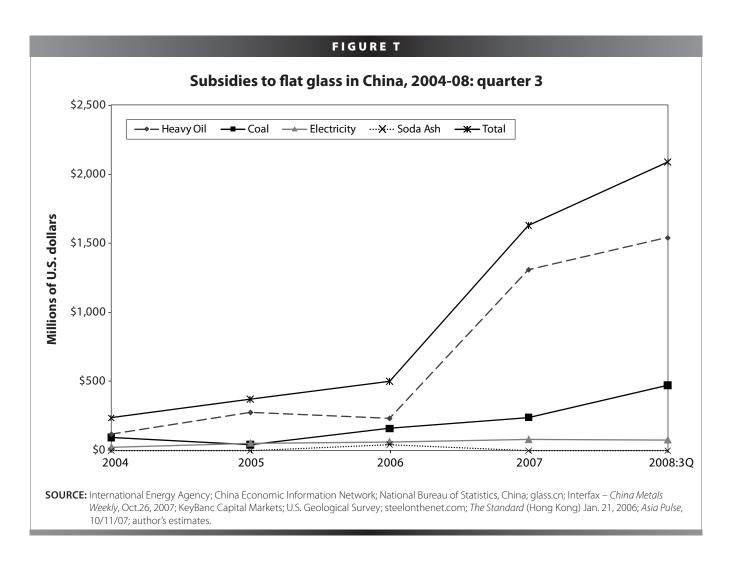
Subsidies to China's glass and glass products industry

This section calculates the subsidies to China's flat-glass sector for heavy oil, coal, electricity, and soda ash. The mathematical equations to calculate these subsidies can be found in the **Appendix**. An analysis extends the results to the glass and glass-products industry in China.

Subsidies to flat-glass sector

Discernible total subsidies for all inputs to the flat-glass sector in China between 2004 and the third quarter of 2008 reached \$4.8 billion. The increase was steepest after 2006, when the price of both heavy oil and coal rose sharply, and a subsidy payment appeared for soda ash. Because the calculations included only those subsidies that could be traced,

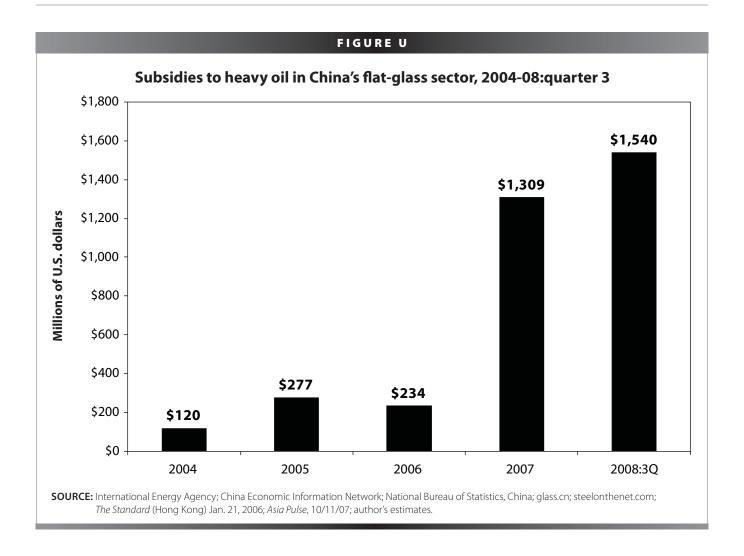
confirmed, and recorded, the total subsidies in this report constitute very conservative estimates for the Chinese flat-glass sector. The trend of rising subsidies explains to some extent why so many small companies remained profitable during this period despite an apparent squeeze between stagnant prices of flat glass and very rapidly increasing raw-material prices. Labor only accounts for 2% of the costs of producing flat glass and the lack of economies of scale and scope



strongly suggest that the inefficient and polluting Chinese glass industry has been getting support, probably from provincial governments. **Figure T** traces subsidies to the flat-glass sector over the last five years.

Subsidies to heavy oil

Subsidies for heavy oil to the flat-glass sector in China between 2004 and the third quarter of 2008 reached \$3.5 billion. The increase was steepest in 2007 and 2008, when the price of heavy oil sky-rocketed. As mentioned earlier, the oil companies recorded subsidies from the central government as revenues spread out over years. Consequently, the total subsidies to heavy oil would be very difficult to discern. **Figure U** indicates the presence of some subsidies to heavy oil in each year of the period shown.



Subsidies to coal

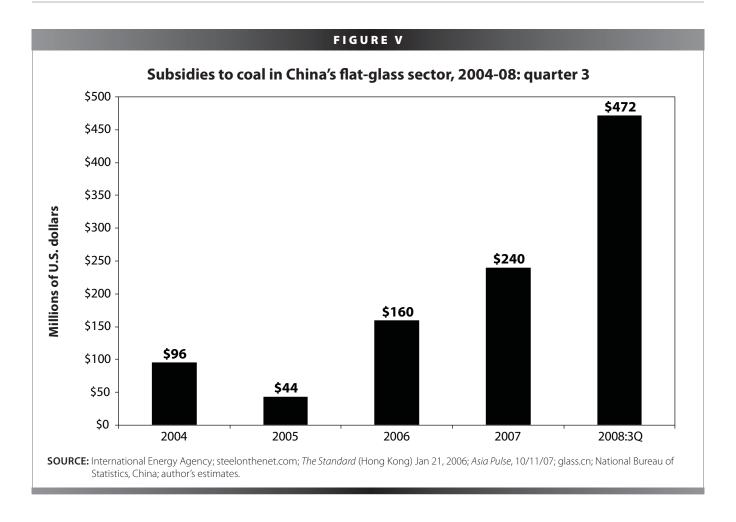
Subsidies for coal to the flat-glass sector in China between 2004 and the third quarter of 2008 reached \$1.01 billion. The increase was steepest in 2008, when the price of coal soared. **Figure V** indicates the presence of some subsidies to coal in each year of the period shown.

Subsidies to electricity

Subsidies for electricity to the flat-glass sector in China between 2004 and the third quarter of 2008 reached \$290 million. Table 7 defined the breakdowns of coal-price and provincial subsidies. The total for provincial subsidies approximated \$164 million; the total for coal-price-increase subsidies reached \$126 million. **Figure W** indicates the presence of some subsidies to electricity in each year of the period shown.

Subsidies to soda ash

Discernible subsidies to soda ash in the flat-glass sector could only be gauged for the year 2006, because of murky data. In 2006, subsidies to soda ash approximated \$44 million. As shown in Figure Q and Figure R, soda ash constitutes a key cost for Chinese glass manufacturers, almost all of whom use Chinese soda ash, which is considerably more expensive than the U.S. version. Additionally, the price of soda ash climbed after 2005, putting a strain on companies' operating

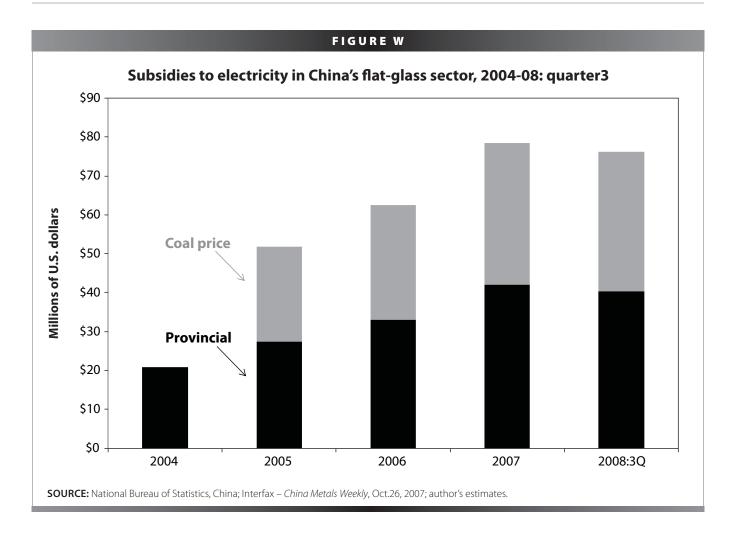


margins. Yet, the poor-quality data on prices did not reveal this. The price paid for soda ash was gathered from industrial surveys and could have indicated the listed price rather than the actual transaction price.

Subsidies to industry

As **Figure X** shows, subsidies to China's flat glass industry have risen steadily as a share of the gross value of flat-glass output from about 7% in 2004 to 34% in 2008. As demonstrated earlier, drawing on industry characteristics, discussion with glass-industry experts and academic practice, the flat-glass sector seems to reflect overall trends in the glass and glass-products industry of China. There is every reason to believe that the subsidies identified in this report provide similar benefits to the remainder of the glass and glass-products industry. Consequently, this report uses subsidy rates in flat glass to estimate total subsidies in the entire industry. Structural factors support this assumption. Specifically, a) as shown in this report, the industry characteristics of fragmentation, enterprise size, excess capacity, stage of technology, and increases in production of the flat-glass sector parallel that of the entire glass and glass-products industry; b) roughly the same cost structure spans all sectors of the industry; c) interviews with analysts, managers, and glass-industry experts confirm that subsidies are not unique to the flat-glass sector, and that other sectors within the glass and glass-products industry also receive similar subsidies; and d) in situations where industry-wide data are limited or non-existent, extrapolating from a sample of companies to the industry constitutes accepted academic practice. Indeed, many industrial associations in China extrapolate from non-random samples when conducting industrial surveys.

The Chinese flat-glass sector was responsible for approximately 21% of the output of the glass and glass-products industry between 2004 and the third quarter of 2008 as shown in Table 1. This share has been relatively constant, though

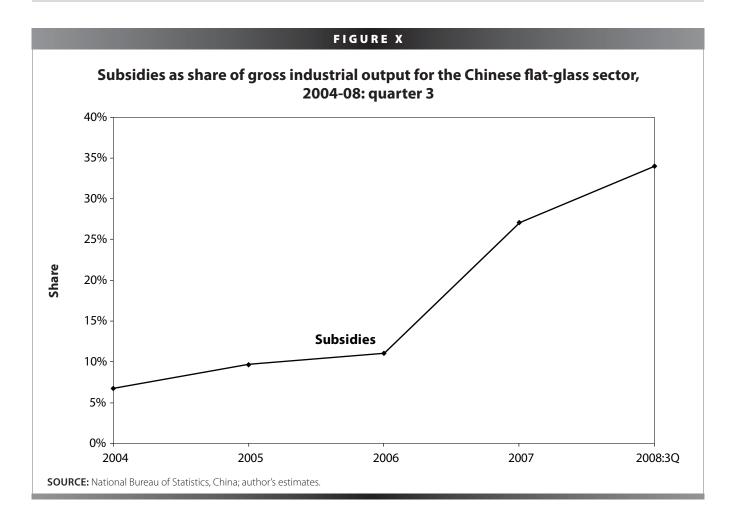


declining slightly, throughout the period under study. Assuming that inputs to glass and glass-products are subsidized at rates similar to those found for the flat-glass sector, this report estimates that total subsidies to the glass and glass-products industry between 2004 and the third quarter of 2008 were at least \$30.3 billion and have been increasing annually.

Conclusions and future directions

In 2008, six Chinese governmental departments released a document with guidelines on improving the structure of the flat-glass sector specifically and for the glass and glass-products industry generally.²² Concerns included:

- The unbalanced and uncontrolled production capacity that pervaded the industry and was geared toward lowend production. As the document emphasized, only 25% of Chinese flat glass underwent further processing, well below the world average of 55% (with industrialized countries having averages of between 65% and 85%). Chinese glass processing added value of less than 250%, yet the average for the industrialized countries approximated 500%. Float glass had 52 Chinese manufacturers with an average capacity of just 683 (10,000 weight boxes). This contrasts sharply with scale economies possessed by the industry's top four international companies that produced 41% of sheet glass in the world and 50% of processed glass.
- Some Chinese manufacturers were cutting corners by labeling non-standard products as standard, thereby increasing
 fears about product safety.



Beijing's goals included:23

- Limiting flat glass's total-production capacity to 550 million weight boxes, with float glass taking more than 90% of the total;
- Emphasizing quality float glass and special glass that would comprise 40% of total float glass;
- Stressing that 40% of all glass and glass products would go through further processing;
- Encouraging the 10 largest enterprises to generate 70% of sales and individual enterprises to reach annual production of 3,000 (10,000 weight boxes) or more through mergers and acquisitions and investing abroad to acquire expertise and brand recognition;
- Limiting capacity by insisting that new float-glass projects require approval from provincial governments, instituting
 more checks and controls on the glass industry in the east—but encouraging growth of the industry in the west, and
 requiring the central government's review of all new projects approved since 2006;
- Encouraging Luoyang float-glass technology, developed in China, as the industry standard, thereby supporting a subsidy based on brand equity;²⁴ and
- Encouraging business associations to collect and to publish supply/demand analysis and data on this spottily covered industry, as well as to make suggestions on governmental policy.

The central government's goals and exhortations appear to have had little support from provincial governments and no effect on glass production. Preliminary statistical analysis indicates that subsidies appear to be highly correlated with the output of Chinese flat glass and with U.S. imports of glass and glass products from China.²⁵

In the midst of a global recession, subsidies to Chinese glass are increasing. Besides the subsidies highlighted in this report, Beijing's stimulus package includes elimination of export taxes, possible devaluation of the currency, and an infusion of loans into the manufacturing sector to boost exports. In March 2009, Beijing announced that it will reduce export taxes to zero and give more financial support to exporters as it tries to increase its share of global trade in the current crisis (Anderlini 2009). The collapse in global trade in recent months led to a 17.5% drop in Chinese exports in January 2009, and the decline was even larger in February. Zhou Xiaochuan, the central bank governor, also refused to rule out devaluation of China's currency. In the first two months of 2009, China's state-owned banks have additionally been answering the government's call to provide a huge chunk of the financing for the 4 trillion yuan (\$585 billion) stimulus package designed to keep the country on track for 8% growth, despite the collapse in exports and the slump in the domestic real-estate sector. New loans in February 2009 totaled 1.1 trillion yuan (\$157 billion), down from the record of 1.6 trillion yuan in January, but still very high by historical standards (Reuters 2009). In March 2009, China was already more than halfway toward reaching its goal of at least 5 trillion yuan in new bank lending.

Cheap bank loans and export subsidies have aided China's economic recovery in 2009. Chinese banks unleashed \$1.2 trillion in extra lending to Chinese consumers and businesses in the first seven months of 2009. Cheap loans are flowing into factory construction and contributing to excess capacity in industries, including glass. To keep Chinese exports competitive, the central government has offered tax breaks and other assistance to exporters, placed broad restrictions on imports, and intervened heavily in currency markets to hold down the value of the yuan. Indeed, evidence indicates that subsidies have increased at all levels of government: for example, in September 2009, the Wuxi municipal government offered up to \$146,000 to each local business that increases exports in the last three months of the year (Bradsher 2009).

Appendix: Definition and measurement of variables

This report identifies and measures subsidies to the flat-glass sector of the glass industry in China, specifically to heavy oil, coal, electricity, and soda ash. The mathematical equations to calculate subsidies follow:

1. Heavy oil subsidies (HO_{hos}):

$$HO_{hos} = \sum_{yr}^{2008} ((WPHO_{yr} - CPHO_{yr}) THO_{yr}), \text{ where:}$$

HO_{hos} = Total subsidies paid to Chinese flat-glass sector for heavy oil

WPHO_{vr} = World price of heavy oil in each year from 2004 to 2008

 $CPHO_{yr}$ = Chinese price for heavy oil in each year from 2004 to 2008

THO_{yr} = Metric ton usage in the Chinese flat-glass sector of heavy oil in each year from 2004 to 2008

2. Coal subsidies (T_{cs}):

$$T_{cs} = \sum_{yr}^{2008} ((WPT_{yr} - CPT_{yr}) KT_{yr})$$
, where:

 T_{cs} = Total subsidies paid to Chinese flat-glass sector for coal

 WPT_{yr} = World price of coal in each year from 2004 to 2008

 CPT_{vr} = Chinese price for coal in each year from 2004 to 2008

KTy_r = Ton usage in the Chinese flat-glass sector of coal in each year from 2004 to 2008

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

 $CPI_s = \sum_{s}^{2008} Vr (Syr (EUyr x SEUyr)), where:$

CPI_s = Total benefits to Chinese flat-glass sector for coal-price subsidy paid to electricity-generation industry

 EU_{vr} = Total electricity usage in each year from 2005 to 2008

SEU_{vr} = Percent of electricity usage by Chinese flat-glass sector in each year from 2005 to 2008

 S_{yr} = Coal-price-increase subsidy rate in each year from 2005 to 2008

4. Provincial electricity subsidies (PE_s):

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

PE_s = Total benefits to Chinese flat-glass sector by provinces' electricity subsidies

 EU_{yr} = Total electricity usage of Chinese flat-glass sector in each year from 2004 to 2008

 SEU_{yr} = Percent of value produced by Chinese flat-glass sector in electricity-subsidizing provinces in each year from 2004 to 2008

Skwh_{vr} = Coal-price-increase subsidy rate in each year from 2004 to 2008

And SEU_{yr} is determined by:

$$SEU_{yr} = \sum_{yr}^{2008} ((6((TS_{yr} - TSIP_{yr})/Pr) + TSIP_{yr})/TS_{yr}), \text{ where:}^{26}$$

TS = Total flat-glass production in all Chinese provinces producing flat glass

TSIP = Total flat-glass production in 8 Chinese provinces identified as paying electricity subsidies

Pr = Number of provinces producing flat glass less the eight provinces identified as paying electricity subsidies

5. Soda ash subsidies (SA_s):

$$SA_{s} = \sum_{yr}^{2008}$$
 (($WPSA_{yr}$ - $CPSA_{yr}$) USA_{yr}), where:

SA_s = Total soda ash subsidies paid to flat-glass sector

WPSA_{vr} = World price of soda ash in each year from 2004 to 2008

CPSA_{vr} = Chinese price of soda ash in each year from 2004 to 2008

USA_{yr} = Soda ash usage in Chinese flat-glass sector in each year from 2004 to 2008

—Usha C. V. Haley is currently an Asia Programs Fellow, Ash Institute for Democratic Governance and Innovation, Harvard Kennedy School, Harvard University. She has been a professor of business at major universities around the world, and has testified on her research before a number of Congressional Committees and U.S. government agencies. Her research interests deal with business in China, managing in emerging and non-market economies, and business-government relations. She can be contacted through http://usha.tel.

The author thanks George Haley, 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.

Endnotes

- 1. One weight box contains approximately 50 kilograms of glass.
- Author's interviews.
- 3. See last section for governmental policy in China towards glass.
- 4. Author's calculations.
- 5. Ibid.
- 6. Author's interviews.
- 7. New building construction is measured in floor space.
- 8. Author's interviews.
- 9. Author's interviews.
- 10. For coverage of China's coal sector see Melanie, Curtotti, Saunders, Schneider, Fairhead, and Qian (2002) and Melanie and Austin (2006).
- 11 Author's interviews
- 12. The author is indebted to George T. Haley for his help in gathering data and conducting the analyses.
- 13. 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).
- 14. This concern was shared by six Chinese government agencies in guidelines for the Chinese glass and glass products industry released in 2008.
- 15. Wiley Rein LLP (2007) found no systematic evidence of energy subsidies to the Chinese steel industry, but presented anecdotal evidence of an electricity subsidy to Baosteel.
- 16. Birol and Keppler (1999) identified some of the measurement problems that attend the gauging of energy subsidies in China.
- 17. Haley, Haley, and Tan (2004) identified problems surrounding data collection in China and interpretation of official Chinese statistics.
- 18. International Energy Agency (2007).
- 19. See The Economist (2002 and 2006).
- 20. For a discussion on obtaining valid information in Asia, see *The Economist* (2001) and for developments in Chinese accounting, see *The Economist* (2007a).
- 21. For problems surrounding the use of PPP to understand China's economy and prices, see *The Economist* (2007b).
- 22. China Economic Information Network.
- 23. Ibid.
- 24. G. T. Haley (2009) identified a new subsidy used by the Chinese government which was based on developing domestic brand equity.
- 25. Details are available from the author on request.
- 26. Six provinces are paying electricity subsidies but have not been specifically identified by the NDRC; 22 glass-producing provinces have not been specifically identified as paying electricity subsidies by the NDRC.

References

Anderlini, J. 2009. China to cut taxes to zero and boost weak exports. Financial Times, March 10.

Asia Pulse. 2007. China halts preferential pricing of 14 provinces. April 17.

Australian Bureau of Agricultural and Research Economics. 2008-09. http://www.abareeconomics.com

Birol, F. and J. H. Keppler. 1999. Looking at energy subsidies: Getting the prices right. Energy Prices and Taxes, 3rd Quarter.

Bo, K. 2007. Ending oil subsidies serves China's oil security. ChinaStakes.com, December 26.

Bradsher, K. 2009. Recovery picks up in China as U.S. still ails. New York Times, September 29.

China Association of Automobile Manufacturers. 2008-2009. http://www.china786.com/auto/ (Accessed 2008-2009)

China Economic Information Network. 2003-2009. China Statistical Databases.

Claro, S. 2006. Supporting inefficient firms with capital subsidies: China and Germany in the 1990s. *Journal of Comparative Economics*. Vol. 34, pp. 377-401.

The Economist. 2001. From bamboo to bits and bytes. April 7.

The Economist. 2002. How cooked are the books? March 14.

The Economist. 2006. Dim sums. November 2.

The Economist. 2007a. Cultural revolution. January 11.

The Economist. 2007b. A less fiery dragon? November 29.

General Administration of Customs (China). 2008. http://english.customs.gov.cn/publish/portal191/tab3972/info174200.htm

Girma, S., Y. Gong, H. Gorg, and Z. Yu. 2007. "Can Production Subsidies Foster Export Activity? Evidence from Chinese Firm-Level Data." Working Paper Series No. 6052. London: Centre for Economic Policy Research. January.

Haley, G. T. 2009. Expert testimony on "State-Owned Enterprises: Vehicles of Industrial Policy Implementation", Hearing on "China's Industrial Policy and Its Impact on U.S. Companies, Workers and the American Economy." Washington, D.C.: U.S.-China Economic and Security Review Commission, March 24.

Haley, G. T. and C. T. Tan. 1996. The black hole of South-East Asia: Strategic decision-making in an informational void. *Management Decision*. 34 (9), pp. 37-48.

Haley, G. T., U. C. V. Haley, and C. T. Tan. 2009. New Asian Emperors: The Business Strategies of the Overseas Chinese. Hoboken, N.J.: John Wiley & Sons.

Haley, G. T., U. C. V. Haley, and C. T. Tan. 2004. *The Chinese Tao of Business: The Logic of Successful Business Strategy.* Hoboken, N.J.: John Wiley & Sons.

Haley, U. C. V. 2008. "Shedding Light on Energy Subsidies in China: An Analysis of China's Steel Industry from 2000-2007." Washington, D.C.: The Alliance for American Manufacturing. January 8. http://www.americanmanufacturing.org/wordpress/wp-content/uploads/2008/01/energy-subsidies-in-china-jan-8-08.pdf

Haley, U. C. V. 2006 Expert Testimony on "Chinese Economic Planning and the Role of Subsidies." Hearing on China's WTO Compliance and Industrial Subsidies. Washington, DC: US-China Economic and Security Review Commission, April 4.

Haley, U. C. V. and Haley, G. T. 2008. The real source of the China price. Harvard Business Review. June, pp. 25-26.

Institute of Energy Economics. 2006. "China's Electric Power Industry and its Trends." Chun Chun Ni Electric Power, Nuclear Power and Coal Group, Industrial Research Unit. April.

Interfax. 2007. China Metals Weekly. October26.

Interfax. 2008a. China Energy Report Weekly. VII (12). March 20-March 26.

Interfax. 2008b. China Energy Report Weekly. VII (34). August 28-September 3.

International Energy Agency. 1999. Looking at Energy Subsidies: Getting the Prices Right. World Energy Outlook, Insights Series. Paris: OECD.

International Energy Agency. 2007. China and India Insights. World Energy Outlook, Insights Series, Paris: OECD.

Melanie, J., R. Curtotti, M. Saunders, K. Schneider, L. Fairhead, and Y. Qian. 2002. "Global Coal Markets." ABARE Research Report. 02.2.

Melanie, J., and A. Austin. 2006. China's coal sector. Recent developments and implications for prices. *Australian Commodities*. Vol. 13 (3), pp. 542-54. September.

National Bureau of Statistics, China. 2003-09. Yearly Statistics.

National Bureau of Statistics, China. 2003-09. Monthly Statistics.

Reuters. 2009. Chinese loans surge as output and sales slow. March 12.

Stanway, D. 2009. Fuel prices: New, improved—and higher. China Economic Quarterly. March, 10-12.

Waldmeir, P. 2009a. Government stimulus gives China car sales surprise boost. Financial Times. February 11.

Waldmeir, P. 2009b. China auto sales increase 90%. Financial Times. September 9.

Wiley Rein LLP. 2007. "Money for metal: A detailed examination of Chinese government subsidies to its steel industry." July.

World Bank. 1997. "Expanding the measure of wealth: Indicators of environmentally sustainable development." Environmentally Sustainable Development Studies and Monograph Series no.17. Washington, D.C.: World Bank.

World Trade Organization. 2006. "World trade report: Exploring the links between subsidies, trade and the WTO." http://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report06_e.pdf