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PUTTING THE PEDAL TO THE METAL

Subsidies to China's Auto-Parts Industry from 2001 to 2011

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Executive summary

China is currently the largest car market in the world. It is also one of the largest auto-parts producers and exporters in the world, with exports, primarily to the United States, constituting about a third of its production. The Chinese government has provided subsidies for auto-parts manufacturing in China, and strategic decisions by Chinese policymakers and foreign companies have ramifications for the U.S. and global economies.

- Since 2001, the Chinese auto-parts industry has received about $27.5 billion in subsidies. Over the next decade, China's central government has committed to disburse an additional $10.9 billion in subsidies for industrial restructuring (mainly outbound mergers and acquisitions) and technological development of the auto-parts industry.

- The Chinese auto and auto-parts industries have also benefited enormously from other government policies. China's central and 24 provincial governments have classified the automotive industry as a "pillar industry." For the last decade, Chinese government policy for auto parts has been one of extensive institutional support for the acquisition and development of cutting-edge technology, including new energy and green technologies.

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- The Chinese auto-parts industry has grown more than 150% since 2004. However, despite official endorsement of consolidation, the industry remains highly fragmented into more than 10,000 registered and more than 15,000 unregistered manufacturers.

- Although fixed investments in auto parts have been rising, output value has been rising even faster, demonstrating the Chinese auto-parts industry's transition into higher value-added manufacturing and the success of government policies encouraging technology development. A number of Chinese domestic enterprises are emerging as world-class competitors.

- China is the fourth-largest exporter of auto parts in the world (after Germany, the United States, and Japan) and also the fourth-largest exporter of auto-parts to the United States (after Canada, Mexico, and Japan), having overtaken Germany in 2008.

- While other foreign auto companies operating in China have linked to auto-parts suppliers back home, U.S. auto companies have cut ties with suppliers in the United States or encouraged them to manufacture in China. U.S. global auto strategy currently centers on manufacturing in China and exporting back home. Consequently, China's exports of auto parts to the United States are three times those of its next highest trading destination, Japan.

- In auto parts, China runs a trade deficit with every major auto-producing country except the United States.

- American imports of auto parts from China have risen faster than those from any other country. Between 2000 and 2010, imports of Chinese auto parts into the United States increased about eight-fold and are expected to continue to increase. During the same period, the U.S. trade deficit with China on auto parts increased nine-fold.

- Specific subsidies from 2001 to 2011 to Chinese auto-parts manufacturers included approximately \$2.3 billion in subsidies (from 2001 to 2009) to 73 companies reported in their annual reports; approximately \$1 billion in subsidies for coal (from 2001 to 2010); approximately \$0.6 billion in subsidies for electricity (from 2002 to 2010); approximately \$0.3 billion in subsidies for natural gas (from 2004 to 2010); approximately \$1.6 billion in subsidies for glass (from 2004 to 2010); approximately \$3.2 billion in subsidies for cold-rolled steel (from 2003 to 2010); and approximately \$18.4 billion in subsidies through technology-development and industrial-restructuring policies (from 2001 to 2011) from the central government and seven local governments.

Introduction

Auto-parts consumption is directly linked to the demand for new vehicles. In January 2009, for the first time, China overtook the United States to become the largest car market in the world by volume (Bloomberg 2009). As Chinese government subsidies and other policies spurred demand, auto companies sold 13.8 million vehicles in China, an increase of 48% over 2008 (International Trade Administration 2010), compared with 10.4 million cars and light trucks sold in the United States, the lowest level in 27 years.

In 2010, estimates had China producing around one-seventh of the world's vehicles, ranking second after Japan in passenger-car production and second after the United States in commercial-vehicle production.[1] *China Automotive Review* projected that vehicle sales in China could reach 18 million units in 2010, a level that would cement China's place as the world's biggest market.

Meanwhile, J.D. Power and Associates estimated that vehicle sales in the United States could reach nearly 11.6 million units (Cable 2010). In December 2010, General Motors announced that Shanghai GM, one of its two joint ventures (JVs) in China with the state-owned enterprise (SOE) Shanghai Automotive Industry Corporation (SAIC), had succeeded in becoming China's largest car manufacturer. GM had become China's first passenger-car manufacturer to achieve annual sales of 1 million vehicles (Cable 2010).

While auto sales in the rest of the world slumped during the 2008 recession, the Chinese central government cut sales taxes on smaller, fuel-efficient cars and spent \$730 million on subsidies for buyers of larger cars, pickup trucks, and minivans.

Stimulus spending on building highways and other public works also helped to boost sales of vehicles. **Figure A** tracks the rise in the number of cars produced and sold in China from 1994 to 2009. While these actions stimulated demand, the Chinese central and provincial governments continued to subsidize the production of auto parts.

However, the growth of China's auto-parts industry also reflects the global strategies and manufacturing and distribution decisions of multinational corporations, notably U.S. corporations (see Haley, U.C.V 2001; Haley and Haley 2008, 2012). This paper covers some of the subsidies that the Chinese government has provided for auto-parts manufacturing in China and some of the ramifications of Chinese policymakers' and foreign companies' strategic decisions on the U.S. and global economies.

Characteristics of China's auto-parts industry

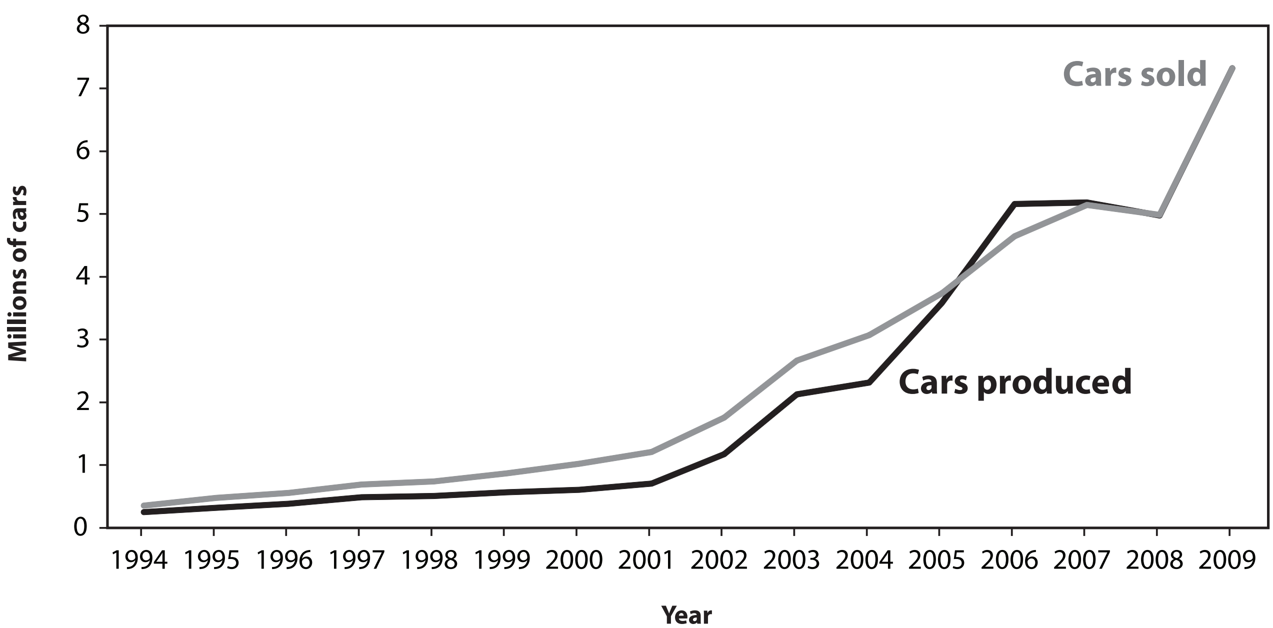
China's auto-parts industry has expanded rapidly since the early 2000s, on the back of the unprecedented growth in the country's vehicle industry. The industry grew by 150% from 2004 to 2008; recorded sales in 2009 totaled $136.5 billion. The number of auto-parts companies registered with the Chinese government rose from 4,205 in 2002 to 10,331 in 2008, and they employed about 1.9 million people.

About 15,000 non-registered automotive-component manufacturers also appear to exist in China (KPMG 2010–2011). These non-registered companies include captive operations of diversified groups whose main products are not auto parts; small aftermarket-equipment manufacturers; or small companies supplying parts for the commercial vehicle, agricultural, and off-highway sectors.

Partial-year statistics from January to August 2009 from the China Association of Automobile Manufacturers (CAAM 2010–2011) show that the total output by value of 10,761 Chinese auto-parts companies topped $110 billion and was expected to reach $176 billion in 2010 (Xinhua News Agency 2010). For 2010, analysts predicted industry revenue of $195.31 billion, up 10.2% from 2009, and annualized growth of 23.2% since 2005 (using constant 2010 dollars), slower than previous years due to the global financial crisis and slightly weaker downstream demand (IBISWorld 2010–2011).

FIGURE A

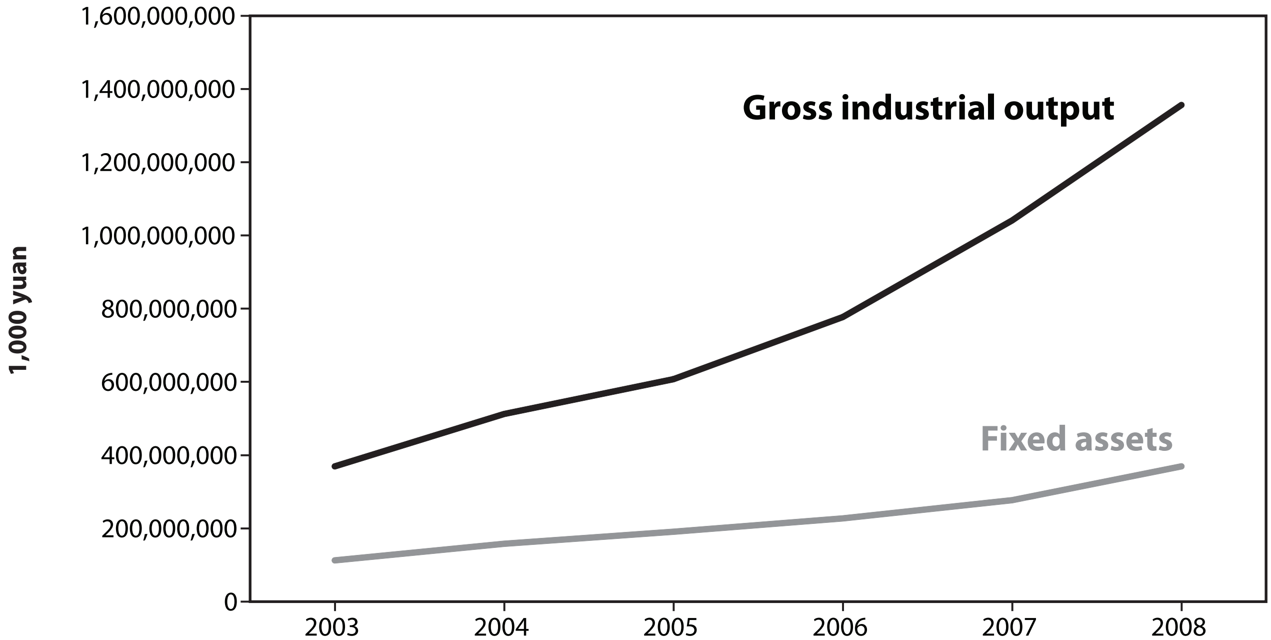
Number of cars produced and sold in China, 1994–2009



SOURCE: Ward's Automotive Group (2010–2011).

FIGURE B

Growth of auto-parts industry in China, 2003–08



SOURCE: National Bureau of Statistics, China (2010–2011).

Figure B shows the growth of the auto-parts industry in China from 2003 to 2008. Although fixed assets have been rising, output value has been rising even faster — demonstrating the Chinese auto-parts industry's transition into higher value-added manufacturing and the success of government policies regarding technology development and creation of world-class competitors.

Despite the rapid growth of China's automotive sector over the last decade, its auto-parts industry remains relatively small but is expanding at a rapid pace. By value, China's auto-parts industry equals just one-fifth of the U.S. total, and one-twentieth of the world's total. This small share reflects the low position that so many of China's auto parts occupy on the value chain.

Over the last decade, the Chinese government has increased various subsidies for international auto-parts makers to relocate higher-value-added production to China. For example, in the second half of 2008, Honda increased the local content of its Jazz, produced in Guangzhou for export, from 60% to 90%. Some analysts expect the industry to reach about $350 billion in value by 2015, up from $136.5 billion in 2009 (KPMG 2010–2011).

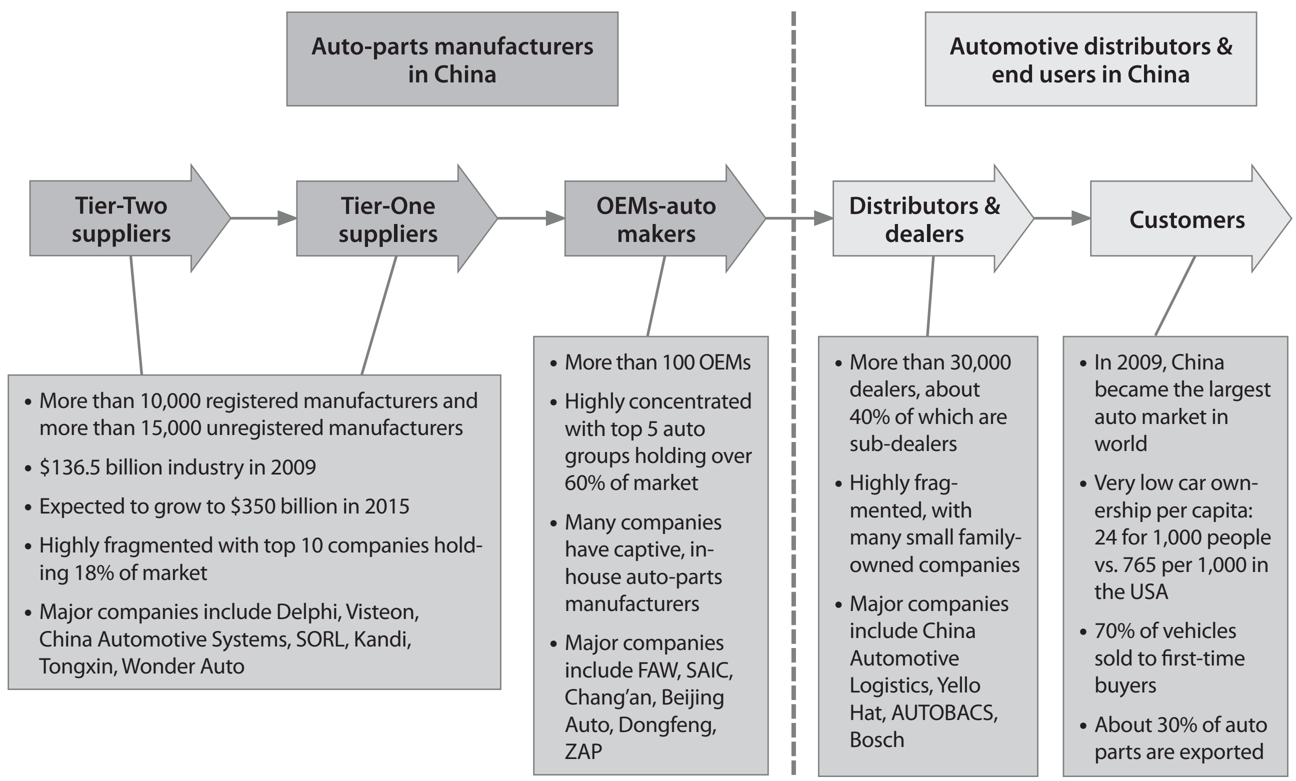
Figure C describes the value chain in China's auto-parts industry. Auto parts include those used by original-equipment manufacturers (OEMs), as well as aftermarket parts. Original-equipment parts go into the assembly of new motor vehicles (automobile, light truck, or truck), or OEMs purchase these auto-parts for their service networks.

Suppliers of OEM parts fall into three levels. Tier-1 suppliers sell finished components directly to OEMs. Tier-2 suppliers sell parts and materials for the finished components to Tier-1 suppliers. Tier-3 suppliers (not in the figure) provide raw materials such as steel to any of the above suppliers or directly to vehicle assemblers.

Much overlap exists between the tiers, with many OEMs having captive, in-house auto-parts manufacturers. Most OEMs focus on their core skills in assembling and source non-core auto parts through their networks of global suppliers. Generally, the largest Chinese auto-parts manufacturers, with scale economies and strong

FIGURE C

The automotive value chain in China



SOURCES: Compiled from author's interviews with industry analysts and experts; Rodman & Renshaw (2010–2011).

research and development (R&D), directly supply system modules to OEMs, while the smaller companies focus on the aftermarket segments.

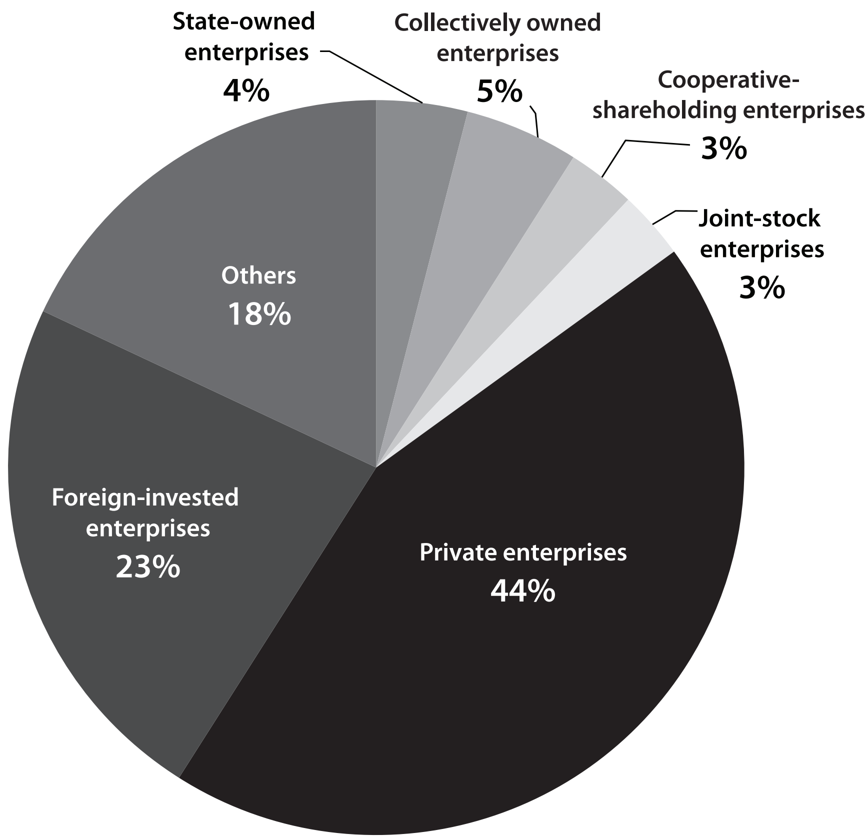
Chinese government policy has successfully upgraded some aspects of the auto-parts value chain (Rodman & Renshaw 2010–2011). First, in the last five years, many automakers have transferred design functions to their Tier-1 suppliers.[2] To meet OEMs' specific needs, the Tier-1 suppliers have also started customizing their products. Many Tier-1 suppliers that used to work with the OEMs' designs have started proposing their own.

Second, as automakers started implementing "just in time" and "quality at source" production techniques for cost savings and quality assurance, they began to rely on Tier-1 suppliers to achieve the same. Consequently, foreign automakers have become more involved in specifications of their Chinese Tier-1 suppliers' quality systems and started cultivating long-term relationships with these suppliers. Correspondingly, many automakers have required that their Tier-1 suppliers operate in close proximity to them.

Finally, U.S. and other global automakers have started allowing their Chinese Tier-1 suppliers into their global-purchase systems. Leading auto companies have established global-purchasing and sourcing systems to approve their Tier-1 suppliers' production and quality-control systems. Once a Chinese auto-parts company enters such a global-purchasing system, it can bid worldwide for supply contracts with any automaker operating under its OEM's standards.

FIGURE D

Ownership of auto-parts enterprises in China, 2008



SOURCE: National Bureau of Statistics, China (2010–2011).

Industry fragmentation and foreign companies

Despite governmental efforts at consolidation, the Chinese auto-parts industry remains highly fragmented into at least 20,000 small companies. **Figure D** shows that foreign companies accounted for only about 23% of all auto-parts companies in China.

However, as **Figure E** highlights, foreign companies constitute seven of the 10 largest auto-parts companies in China, as measured by number of plants. The three Chinese companies on the list represent the auto-parts arms of the country's three leading vehicles makers – SAIC, First Auto Works (FAW) Group, and Dongfeng Motor.

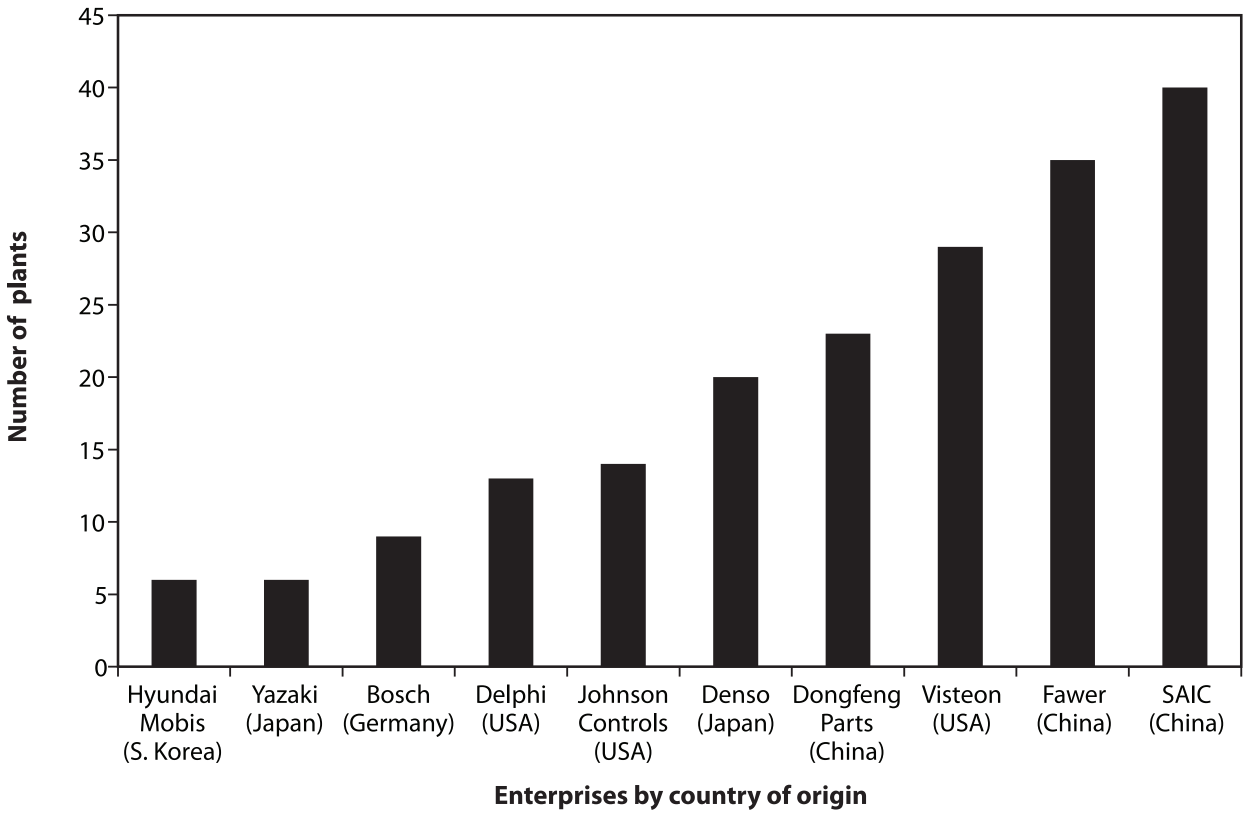
In 2009, more than 70 of the top 100 global auto-parts companies had manufacturing operations in China, and many continued to open or to expand their Chinese operations. For example, GM reported it had more than 198 suppliers in China that supplied its global operations (International Trade Administration 2009).

The proportion of Chinese to foreign companies has stayed roughly the same across the list of top 50 auto-parts makers. The top 50 in the 2008 list featured 13 Chinese companies, with the balance from Japan (also 13 companies), Europe (12), North America (10) and South Korea (2).

Within the ranks of the top 50, their principal customers dictate companies' business models. The large SOEs run vertically integrated conglomerates. A handful of Chinese groups, such as Wanxiang, are establishing themselves as independent auto-parts companies. Chinese car companies, such as Chery and Geely, are

FIGURE E

Top auto-parts manufacturers in China, 2008



SOURCES: Compiled from data from KPMG (2010–2011), J.D. Power and Associates (2007).

sourcing their components largely at the lowest possible cost, not only to lower expenses but also to raise technological standards and strengthen export potential.

Strict regulations do not permit wholly foreign-owned enterprises in auto assembly. In 2009, JVs had a 73% share of passenger-car production in China, compared with only 5% in commercial-vehicle production (Rodman & Renshaw 2010–2011).

More than 25 foreign JVs make passenger cars in China, and **Figure F** shows some representative JVs between foreign and government-owned companies. SAIC, Dongfeng, and FAW constitute the dominant SOEs in the automotive sector. FAW has JVs with Volkswagen and Toyota, Dongfeng with Citroen and Nissan.

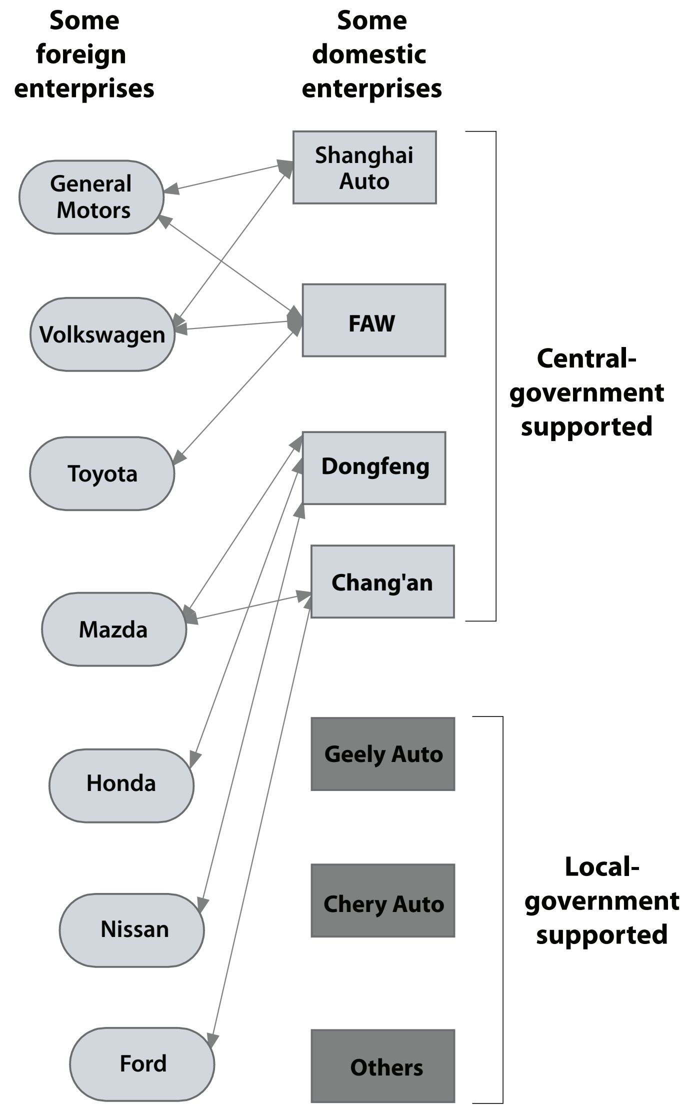
Local governments also play major roles in the Chinese auto-parts industry – the Shanghai government with SAIC, which is in turn a JV partner of GM and Volkswagen. Similarly, the Anhui provincial government owns Chery, the Liaoning provincial government owns Brilliance Automotive, the Beijing municipal government owns the Beijing Automotive Industry Company (BAIC) and currently has a JV with Daimler, its latest in a long line; Beijing Jeep formed China's first JV established in 1984 with American Motors (AMC). Tianjin Automotive Industry Corporation (TAIC) and Guangzhou Automotive Industry Corporation (GAIC) also fall under their municipal governments' control. Many of China's automakers, especially those owned by local governments, appear to benefit from preferential financing as well. Employment and potential tax revenue from automotive ventures drives local governments' interest and support.

Since 2004, the government has allowed 100% foreign ownership of auto-parts companies (State Development and Reform Commission 2004). Yet, direct and indirect Chinese government ownership or influence remains prevalent. Many of the large auto-parts companies have affiliations with the large vehicle-assembly groups that local governments partly own. Other unaffiliated auto-parts companies benefit from government ownership directly. For example, the Xiaoshan municipal government partially owns the Wanxiang Group. Most foreign auto-parts companies have entered China through JVs with local and regional governments, thereby securing access to government equity capital as well as near-guaranteed access to preferential bank loans.

According to AT Kearney, in 2009 the top 10 auto-parts companies accounted for 18% of the total auto-parts market. **Figure G**, which shows revenue breakdowns by ownership, illustrates that foreign companies (generally large) and private companies (generally small and family owned) have the greatest share of revenues. In 2009, only 38 auto-parts companies had annual revenues greater than $146.4 million. Foreign companies dominated in terms of value and also operated higher up in the value chain. Fiducia (China) estimated that foreign companies manufactured more than 90% of the key functional auto parts: China had been levying high import taxes (of 25%, later reduced to 10%) for auto-parts imports, a move that forced foreign companies to set up their own auto-parts manufacturing plants and to invest heavily in R&D. Since no foreign-ownership cap existed for setting up auto-parts companies, most preferred to operate as wholly foreign-owned enterprises with limited technology transfer to domestic Chinese firms, unless constrained to do so.[3]

FIGURE F

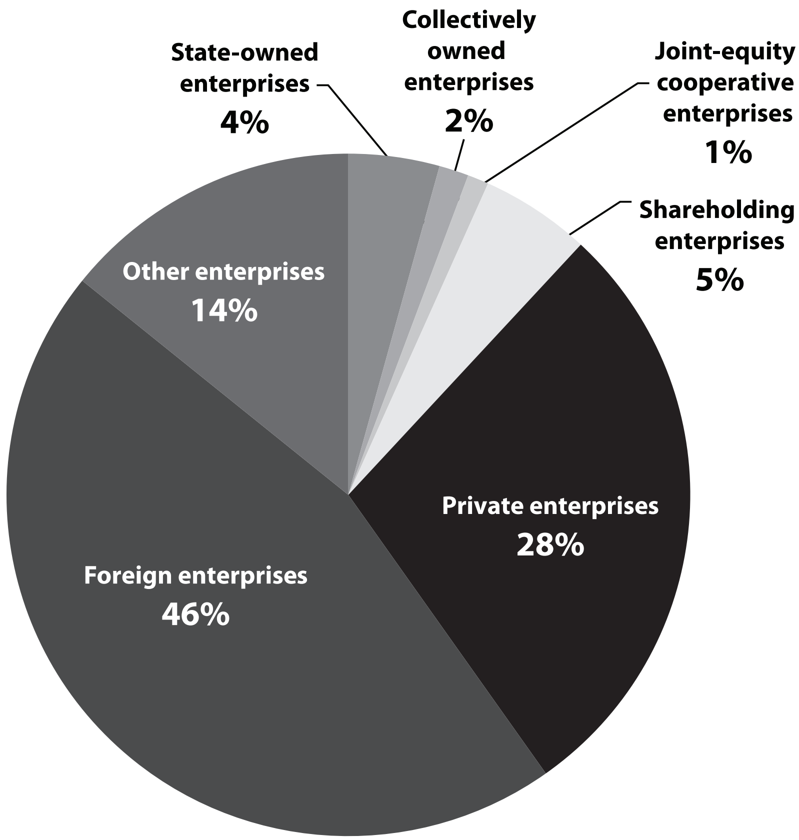
Representative joint ventures in China's auto-parts industry, 2010



SOURCES: Compiled from information from Rodman & Renshaw (2010–2011), author's interviews with industry analysts.

FIGURE G

Shares of revenues in China's auto-parts industry by ownership, 2009



SOURCES: Author's analysis of data from All China Marketing Research Co. (2010–2011), IBISWorld (2010–2011).

Geographic spread and clustering

Table 1 details the wide geographic dispersion of China's auto-parts industry. Major vehicle and auto-parts manufacturers can be found in every major industrial region, across coastal provinces from north to south, and in several inland provinces along the Yangtze River.

However, as **Figure H** shows, the auto-parts industry's operations cluster around the relatively well-developed east China and middle-south China regions, areas with higher per capita incomes, larger populations, and therefore higher usage of automobiles. In 2010, Zhejiang, Jiangsu, Shanghai, Shandong, Guangdong, and Hubei accounted for about 57.5% of total industry revenue.

In addition to these major centers, new vehicle makers – especially car makers – continue to set up in locations with no previous automotive history. Chery, based in Anhui, and Geely, based in Zhejiang, constitute the two leading examples, but more than 100 other companies are scattered across the country, most of them producing fewer than 50,000 vehicles a year.

To date, investment in vehicle-assembly plants has more than doubled that in auto parts. General policymaking and company strategy involves first establishing vehicle-assembly facilities, and then bringing in the auto-parts manufacturers to supply to them. For example, in 1997, Guangzhou had no auto-parts industry. Since then, it has transformed itself into one of China's leading automotive centers by persuading Honda, Toyota, and Nissan to open plants first and subsequently bring in their auto-parts networks.

Globally, auto-parts production requires three times as much capital investment as final-vehicle assembly in fully

TABLE 1

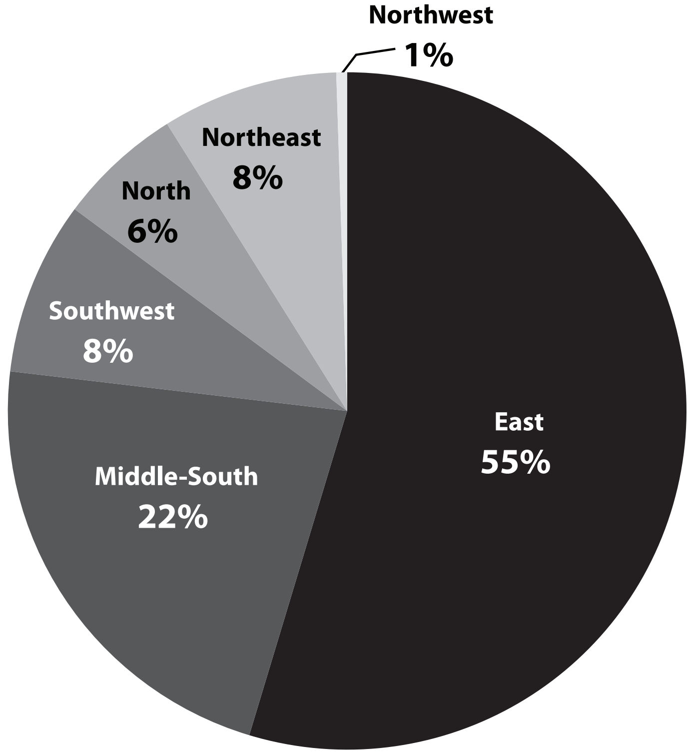
Auto-parts sector in China by province, 2008

District	Number of enterprises (units)	Number of loss-making enterprises (units)	Gross industrial output (1,000 yuan)	Number of employees
National	10,331	1,664	987,038,310	1,927,723
Beijing	229	52	31,454,100	35,409
Tianjin	272	72	49,094,201	59,918
Hebei	296	38	25,062,159	61,809
Shanxi	30	12	2,756,572	13,794
Inner Mongolia	13	5	715,653	2,002
Liaoning	393	78	35,215,973	71,654
Jilin	380	92	55,095,161	96,296
Heilongjiang	77	17	3,806,371	12,644
Shanghai	651	122	99,470,035	146,242
Jiangsu	1,333	189	113,744,478	219,606
Zhejiang	1,964	208	134,968,694	275,704
Anhui	417	100	23,580,326	58,688
Fujian	331	44	24,645,095	68,339
Jiangxi	138	7	8,135,877	20,375
Shandong	790	77	80,214,597	141,696
Henan	367	32	39,293,863	61,361
Hubei	770	175	56,872,204	136,885
Hunan	172	15	14,585,652	38,819
Guangdong	545	111	92,561,791	159,316
Guangxi	255	73	22,471,108	44,791
Hainan	28	4	1,654,727	3,860
Chongqing	506	81	34,028,811	102,069
Sichuan	290	37	24,437,056	59,885
Guizhou	29	11	2,142,091	11,545
Yunnan	18	4	1,042,135	4,719
Shaanxi	35	7	9,868,846	20,112
Gansu	0	1	17,513	30
Xinjiang	0	0	103,221	155

SOURCE: China Data Online (2010–2011).

FIGURE H

Geographic spread of auto-parts establishments across China, 2010



SOURCES: Author's analysis of data from IBISWorld (2010–2011), All China Marketing Research Co (2010–2011).

developed vehicle-supply chains. However, in China, the ratio of capital investments in auto-parts production to vehicle-assembly is roughly 0.3 (Xinhua News Agency 2010); consequently, the Chinese auto-parts industry has room for expansion. Auto-parts investment will likely grow much more rapidly than vehicle assembly in the next several years: The assembly sector has already invested heavily in production capacity, and strong central and local governmental support exists for more technically advanced and specialized auto-parts production in China. In addition to the central government, 24 provinces individually consider auto parts (along with autos) as a pillar, strategic industry, key for provincial and national security (Haley, G.T. 2007, 2009).

Impending overcapacity

Despite China's rank as the world's largest auto market, China's car ownership rate remains very low compared to developed countries. China has 24 passenger cars per 1,000 people, while the global average stands at 120. The United States has the highest car ownership, with 765 per 1,000 people (Rodman & Renshaw 2010–2011). With China's booming economy and rising income levels, many foreign companies expect an increase in passenger-car penetration over the coming years, and they have factored this into their strategic-expansion plans. In addition, these companies expect that favorable government policies (such as preferential sales-tax rates) will stimulate consumer spending on durable goods such as passenger cars.[4]

According to CSM Worldwide, in 2008 North American and European countries had excess auto-production capacity of 44% and 23%, respectively. From 2009 to 2011, the global automobile industry could have average excess production capacity of 30.5 million units, exacerbated in part by the global recession. However, automotive companies in China are expanding production capacity to tap the expected growth in domestic demand.

In November 2009, the National Development and Reform Commission (NDRC) announced that China's auto industry likely would have overcapacity given present market growth of 10% (*Asia Pulse* 2009). Given the market's current level of investment and companies' production-expansion plans, the industry's capacity-utilization rate will fall below 70% in the following years, according to the survey the NDRC conducted (*Asia Pulse* 2009). Industrial parks for auto parts and accessories have been established rapidly and widely around the nation, even in some regions with relatively weak automotive industries, such as those surrounding the cities of Yinchuan, Jiangmen, Huizhou, and Neijiang. In 2009, Tianjin's Great Wall Motor invested $1.24 billion to produce 500,000 vehicles within three years. In 2010, China had more than 30 similar bases at design stages for the production of auto parts and accessories around the country.

The New Energy Vehicle (NEV) sector, to which the Chinese government gives particular attention, also attracted large amounts of investment. In 2009, Beijing planned for NEV production capacity of 500,000 completed vehicles by upgrading the existing production capacity by 2011 and by encouraging the production of electric vehicles, plug-in hybrid-electric vehicles, and ordinary hybrid-power vehicles. However, by the end of 2009, production capacity at the design stage had already surpassed the target of 500,000 completed vehicles. The country had at least 19 businesses investing more than $15 million in founding large-scale power-cell production bases. In November 2009, Tianjin Lishen Battery had invested $110 million to expand the production of lithium cells and planned to invest a further $220,000 in the next couple of months. Hunan Shenzhou Science and Technology had invested $44 million in a Tianjin base, and would put in an additional $205 million. Forever Battery planned to invest $193 million to set up a cell plant with an annual output of 365 million ampere-hours (Ah). In addition, China's BYD and CITIC Guoan Mengguli had similar plans. Chen Bin, head of NDRC's Department of Industry, said that the industry's supply might be much heavier than the market demand after 2010 in terms of the current expanding plans (*Asia Pulse* 2009).

Imports and exports of Chinese auto parts

In 2008, China became the fourth-largest exporter of auto parts in the world after Germany, the United States, and Japan (International Trade Administration 2009, 2010). The latest trade data from the International Trade Administration, which aggregates the auto-parts industry broadly and includes tires, glass, bodies, and other commodities which other trade aggregations exclude, show that in 2010, estimated Chinese exports of auto parts approximated $43.86 billion — an increase of 162% from $16.7 billion in 2005 (International Trade Administration 2011).

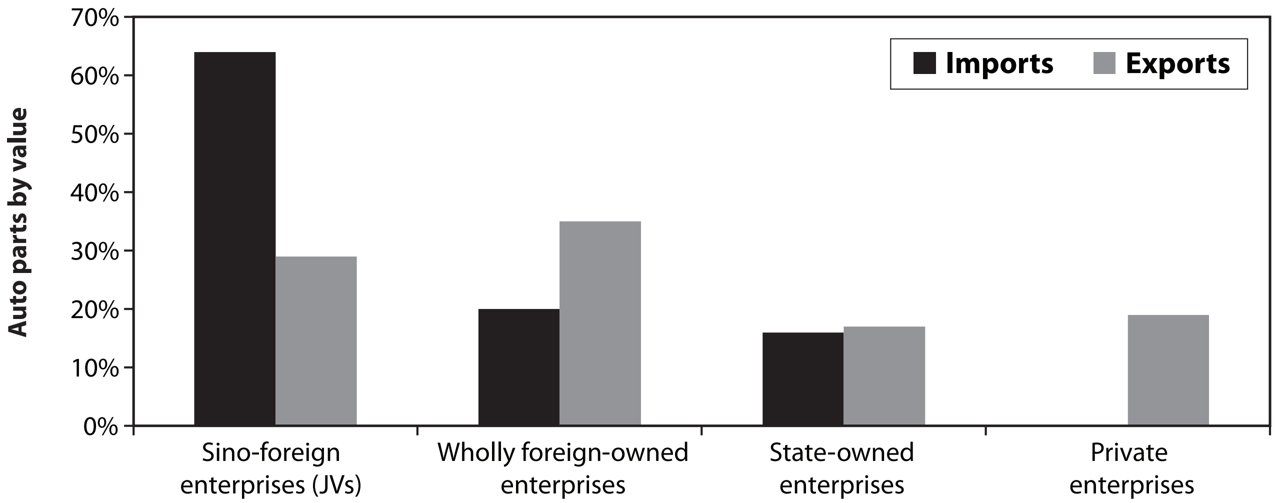
For China, most auto-parts imports consist of higher-end systems and components to incorporate into Sino-foreign vehicle makers' autos. Japan accounts for about half of total imports, and Germany about one-quarter, reflecting the roles of Volkswagen in the mass market and BMW and Mercedes-Benz in the luxury market (CAAM 2010–2011, Netscribes 2010–2011, China Customs 2010–2011). The three companies have great reliance on imported components. In contrast, China imports very little from the United States, reflecting the presence of American companies at the top end of China's auto-parts industry.

Figure I shows that JVs serve as the greatest importers of auto parts. Unlike the Japanese and German JVs, U.S. automotive JVs rely to a much greater extent on Chinese auto-parts manufacturers, thereby contributing to the bilateral trade imbalance by reducing their use of U.S.-made parts. The United States has also been by far the leading export destination for Chinese auto parts, indicating the extensive integration of U.S. auto-parts companies in the Chinese export machinery.

In auto parts, China runs trade deficits with every other major auto producer, including Japan, South Korea, and Germany. In contrast, China's trade surpluses on auto parts with the United States constitutes a notable exception. As other foreign auto companies operating in China have linked to auto-parts suppliers back home, U.S. auto companies have increasingly cut ties with U.S. suppliers or encouraged them to manufacture in China.

FIGURE I

Auto-parts trade by type of enterprise in China, 2007



SOURCE: Investment Association of China (2010–2011).

In 2006, Ford announced that, to cut costs, the company planned to double the value of the auto parts that it sourced from China to about $3 billion from about $1.6 billion in 2005 (Dyer 2006). In 2008, GM, which was buying 20 million parts a month from 190 Chinese suppliers, announced that it intended to buy more and increasingly sophisticated car components in China for worldwide assembly.[5] The company stated that it would increase its procurement spending in China by 25% per year in the period 2005–10 (Zubko 2008). U.S. global auto strategy has progressively centered around manufacturing in China and exporting back home. Consequently, China's exports of auto parts to the United States are three times those of China's next highest trading destination, Japan.

China's auto-parts exports are expected to grow dramatically in the future, driven primarily by two factors: exports to overseas automakers and exports to overseas Tier-1 suppliers.[6] Foreign, primarily U.S., automakers' captive centers in China will probably supply their home bases directly. For example, GM and Ford have recently announced that, by 2010, they will purchase more than $10 billion and $7 billion worth of auto-parts and accessories, respectively, from their sourcing centers in China.

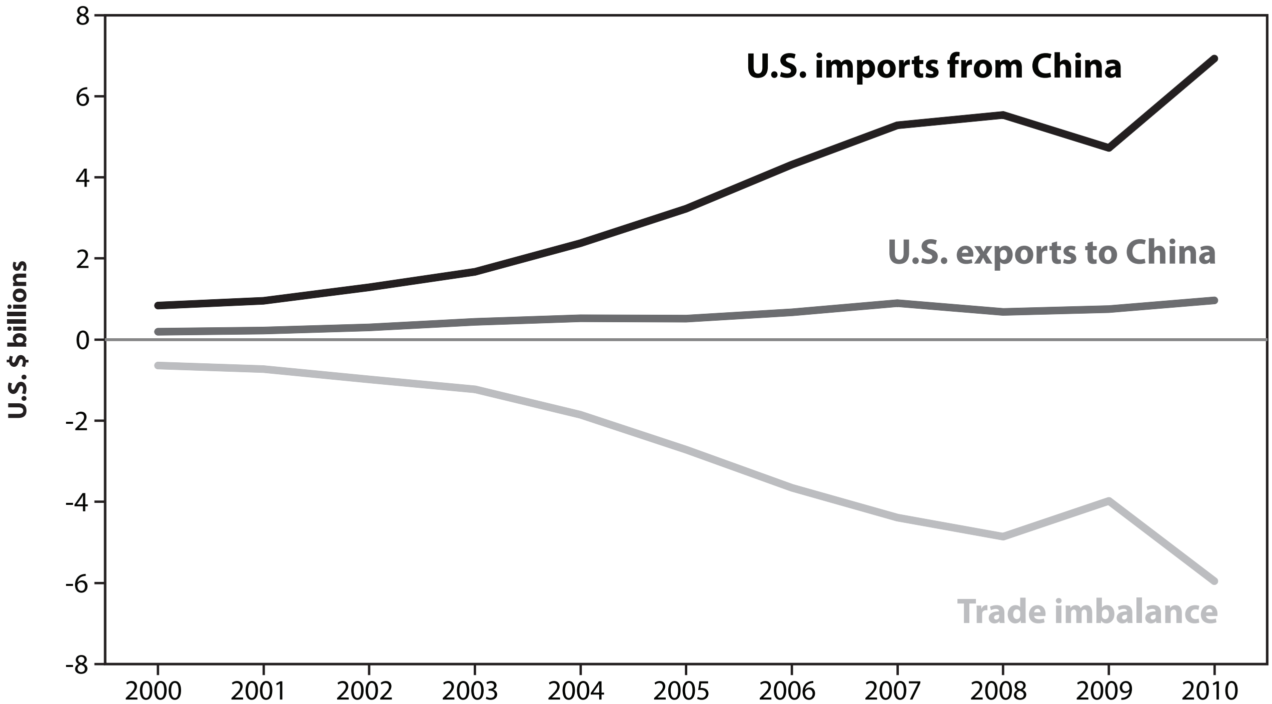
In 2008, China overtook Germany to become the fourth-largest source of imports for U.S. auto parts (after NAFTA partners Canada and Mexico, and Japan), and in 2011 is among the fastest-growing sources of U.S. imports (along with Korea and Mexico). As **Figure J** shows, from 2000 to 2010 imports of Chinese auto parts into the United States increased about eight-fold and are expected to continue to increase. During the same period, the U.S. trade deficit with China on auto parts increased nine-fold.

In 2009, the NDRC, China's central economic planning agency, released *Directives on Promoting the Healthy and Sustainable Growth of Domestically-Made Auto Products* to increase auto-parts exports. According to the directives, the government will facilitate auto and auto-parts manufacturers' efforts in getting loans from domestic banks to fund their exports. The government has also pledged the services of the state-owned export-credit insurer, China Export & Credit Insurance Co., to manage credit risks in overseas markets for exporting auto-parts companies (China Automotive Technology & Research Center 2009).

The Chinese government has additionally pledged to help domestic auto and auto-parts companies to build

FIGURE J

U.S. trade with China in auto parts, 2000–10



NOTE: Auto parts as categorized by North American Industry Classification System (NAICS) code 3363, as defined by the U.S. Census Bureau.

SOURCE: U.S. International Trade Commission (2010–2011).

overseas R&D centers and to acquire foreign peers to improve their technology and product-development capabilities.

With its support, the government hopes that domestic automakers can expand their exports from the current mainly commercial vehicles to passenger vehicles, compact cars, and small- and medium-sized buses, according to the directives. It also expects domestic parts suppliers to shift their export focus from mechanical products to machinery and electrical and electronic products. With its newly announced support measures, the NDRC expected to see the export value of automobiles and auto parts made by domestic companies grow 10% annually over the next two years and reach $85 billion by 2015 (China Automotive Technology & Research Center 2009).

Cost structure of China's auto-parts industry

The costs of auto parts constitute about 70% of the total production cost of the entire automobile.[7] **Table 2** outlines some of the major raw material and sub-components used in this highly complex industry that spans auto glass/float glass, car tires, car wheels, engine-oil radiators, and inter-coolers as well as car batteries. The great majority of the companies focus on particular parts or markets, and most concentrate on single products. Only some larger companies can manufacture a wide variety of auto parts.

Typically, Chinese auto parts sell for around 30–50% less than comparable auto parts made in Europe, North America, or Japan. Estimating costs in the Chinese auto-parts industry becomes especially difficult because

TABLE 2

Raw materials and sub-components in Chinese auto parts

Auto parts	Major companies	Main raw materials and sub-components
Car glass/float glass	Fuyao Glass	Soda ash/pure alkali, heavy oil, silica sand
Car tires	AEOLUS Tyre, Guizhou Tyre, Yellow Sea Rubber	Caoutchouc, synthetic rubber, carbon black, steel tire cord
Car wheels	Wanfeng Auto	Aluminum
Engine-oil radiators & inter-coolers	Yinlun Machinery	Stainless steel, cold-rolled steel, aluminum alloy, brass, aluminum materials
Car batteries	Fengfan	Lead

SOURCES: Compiled from author's interviews with industry analysts; Haley, U.C.V. (2009).

of subsidies to Tier-3 suppliers including steel and glass manufacturers, and government-controlled pricing of energy (see Haley, U.C.V. 2007, 2008, 2009, 2010; Haley and Haley 2012).

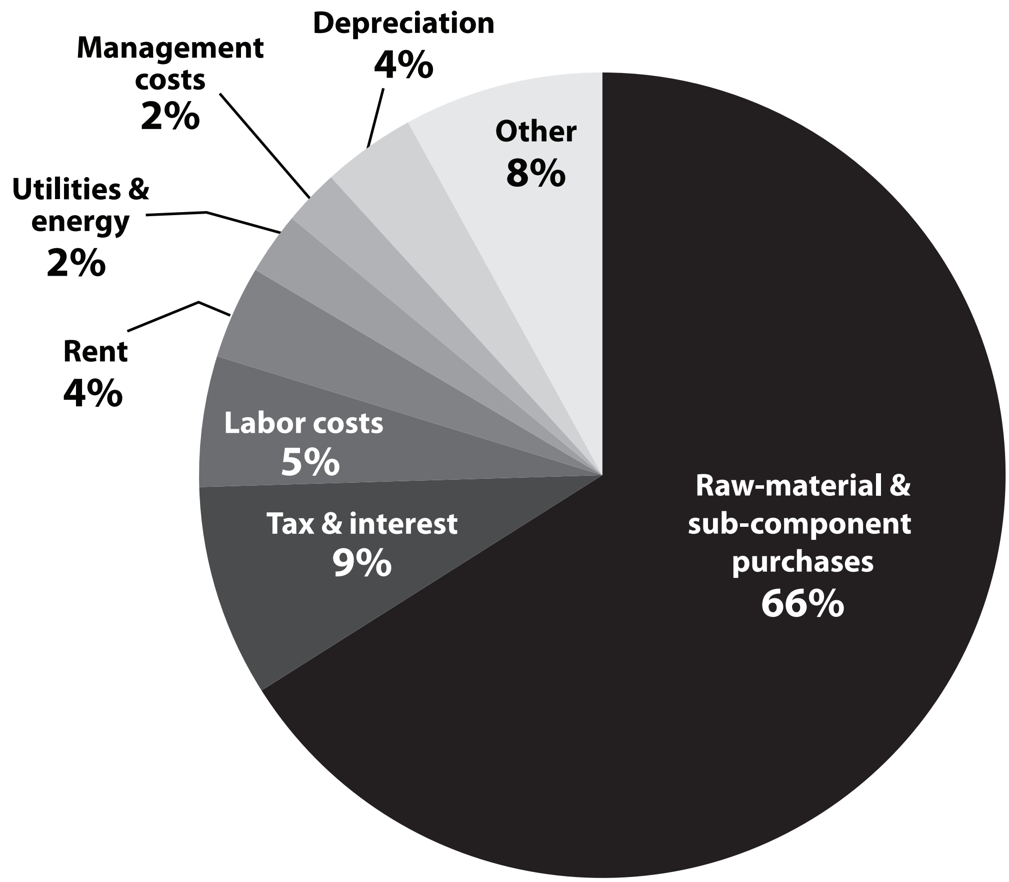
In 2010, mechanical parts and accessories, including bearings, filters, covers, brakes, and clutches, made up the largest segment of this industry, accounting for 56% of total revenues. Mechanical parts formed the majority of automobile components, and their prices have increased in the past few years due to rising raw-material prices. Electric motors, including starting motors, alternators, control units for electronic systems, and mechanical and electronic drivers were the second-largest industrial segment, accounting for 23% of total revenues. Electronic parts and accessories, including electronic-control systems for engines, anti-lock brake systems, meters, GPS, transducers, entertainment systems, and items used for control, safety, communication, and entertainment made up the third industrial segment in the industry, accounting for 21% of total revenues.

Figure K provides a cost breakdown for China's auto-parts industry.[8] Raw materials and sub-component purchases, including iron, cold-rolled steel, glass, rubber, and machine parts contributed to 66% of the costs of manufacturing Chinese auto parts. Labor accounted for just 5% of costs, with another 2% for management costs.[9] Total industry wages have increased significantly during the period under study; annualized growth has been 22%. Total wages experienced the fastest growth in 2008, when the employment level rose by 45% (IBISWorld 2010–2011). The average wage per employee steadily increased over the current performance period, and, simultaneously, the share of wages in industry revenue decreased. This indicates technology changes, higher usage of machinery and equipment, and higher skill requirements in this industry. Utilities and energy contributed 2% of total costs, taxes and interest 9%. "Other costs" (8%) depend on individual companies' operations, such as logistics and transportation, storage, maintenance, subcontracting, insurance, advertising, and other expenses; the costs of these inputs differ across companies.

The Chinese auto-parts industry has high capital intensity.[10] Foreign and SOE companies' large-scale production requires significant capital to install automated processes, equipment, and machinery. Upgrades of plant and equipment and upgrades for process and product development also require significant investment. Many manufacturing processes involve repetitive activities that large and foreign companies have automated to increase production speeds and cost efficiencies. Small-scale domestic manufacturers generally have lower capital-investment levels than larger firms because of the high costs of acquiring new equipment, and because of the basic auto parts they produce. In 2011, foreign capital accounted for more than 36% of China's auto-parts market. Foreign companies monopolize Chinese production of some complex auto parts, such as high-end

FIGURE K

Cost structure of China's auto-parts industry



SOURCE: Author's interviews with industry analysts.

electronic controls, fuel-injection systems, transducers, brake systems, and steering systems.

Role of government policy in China's auto-parts industry

The automotive industry in China benefits immensely from government support. The government considers this industry as a pillar or strategically important industry for the economy, and it has adopted various policies and initiatives to spur strong growth and development (Haley, G.T. 2009). As Zhang Ji, deputy director of import and export of machinery and electronic products at China's Ministry of Commerce (MOFCOM) stated in an interview: "Automobiles are in a way different from other merchandises. Automobile export adds to the dignity of a nation….The auto industry represents a country's overall economic strength. The government should provide vigorous support" (*China Automotive Review* 2006).

Government policy has aimed at increasing domestic auto and auto-parts manufacturing with foreign partners, enabling technology transfer and creating an auto-parts supply base for exports.[11] The government has offered market access to foreign auto companies in return for technology; both soft and hard technology acquisition, not capital acquisition, has motivated China's opening of its auto industry to foreign direct investment (Thun 2004). The central government's policy has also aimed at modernizing and restructuring SOEs to create principal actors or "national champions" in their industries and to displace imported products in China's domestic market. National champions in the automotive sector include the vertically integrated SAIC, FAW, and Dongfeng, which include captive auto-parts manufacturers.

Soviet aid helped to start the Chinese automotive sector in 1953 with the establishment of China's first car company, FAW. In the late 1970s, China's auto industry continued to transform through its open-door policy. China's need to modernize its industrial infrastructure required foreign technology, management, and finance to supplement low domestic savings and nascent R&D capabilities. Import-substitution policies built on a protectionist framework helped the auto and auto-parts industries to evolve and provided shelter. In the 1970s, China's auto industry had small production capacity focused on truck production. In 1978, the country had 56 auto-assembly plants that produced slightly fewer than 150,000 units based on Eastern European designs from the 1950s (Ministry of Machinery 1994).

In 1984, Premier Zhao Ziyang announced that China planned to produce exportable sedans up to world standards, to increase production volumes, and to switch from an "all-under-one-roof mentality of small-scale development" to a "cooperative industrial complex system, centered around large-scale factories based on modern technology" (Iwagaki 1986, 11). Specific objectives included consolidating production in the industry into three large and three small producers with high local content, acquiring advanced technology, and achieving high volumes. JVs with foreign companies would serve as the primary vehicle of industrial upgrading (Thun 2004).

In 1986, the central government designated the automotive industry as a pillar of the national economy. In 1987, the government began to encourage JVs with foreign auto companies while its trade policy continued to nurture domestic auto-parts production. This new policy included compulsory licensing of imports and new production facilities. In the 1991 five-year plan, Beijing referred to the automotive industry as a pillar industry for China. In 1994, the State Planning Commission issued an industrial-policy statement formalizing the state's objectives for the auto industry; it modeled the statement on perceived Japanese and Korean experiences, except for the reliance on JVs for industrial upgrading. Since then, 24 provincial governments have also designated the automotive industry as a pillar industry with local governmental support for restructuring, growth, and exports.

The Auto Industry Development Policy (AIP), issued by the NDRC with every five-year plan, serves as the blueprint for developing China's auto industry. The 2004 AIP encouraged local automakers to develop R&D capabilities, to produce vehicles independently, and to increase exports to $35–40 billion by 2010, an amount accounting for around 40–50% of output. The policy also aimed to have auto parts derive from a series of industry clusters, where domestic companies could establish their own brands and compete in international markets, with advanced technology and capital-intensive products accounting for around 60% of exports. The plan has fallen a little short of these targets.

China's 2004 AIP also formalized some technology-transfer requirements for foreign companies wanting to invest in China's automotive sector. Pursuant to Article 47 of the 2004 AIP, foreign-investment projects in China's automotive industry require the establishment of R&D facilities with an investment of at least RMB 500 million. In Annex II of the 2004 AIP, foreign investors seeking approval of new automobile-production plants must file technology-transfer agreements (Trade Lawyers Advisory Group 2007). In 2011, Beijing announced that foreign auto companies that want to expand in China must launch new brands with their Chinese partners. Earlier in 2011, Volkswagen AG received government permission to build a new assembly plant in south China only after it had agreed to create a new brand for its JV with FAW. The government-financed China Automotive Technology and Research Center (CATARC) concluded that, "With this rule, the government hopes to force global automakers to contribute more technology to their joint ventures" (China Automotive Technology & Research Center 2011).

In the 2004 AIP, two significant laws restricted foreign ownership to 50% shares of any vehicle-manufacturing company in China and restricted foreign vehicle manufacturers to two local JV partners. Foreign OEMs have had to set up JVs for vehicle production, a rule that implicitly forces them to cooperate on vehicle distribution with their local partners. The AIP also paved the way for China's auto-parts industry to become part of the global automotive-purchasing system, and it started to restructure the automotive industry into large groups capable of competing globally. In its 11th Five Year Plan (2006–10) for the automotive industry, the government eliminated the need for state approval for any new investment in auto-parts manufacturing. To create a strong R&D platform in auto parts and to boost technology transfer from foreign companies, Beijing had previously removed the 50% ownership restriction on JVs in auto-parts production. Starting in 2010, auto-parts companies can have 100% foreign ownership and start production without state approval, while auto-assembly companies still cannot.

Unlike the central government's policies, provinces often issue policies abruptly, taking markets by surprise. For example, in 1999, local governments in 13 cities banned the use of diesel vehicles with almost no warning or lead time. The governments have since retracted this policy. Local governments also often pass laws that favor their local economies and businesses rather than national interests (J.D. Power and Associates 2007). For example, some provinces set vehicle specifications for taxis to match those of locally manufactured autos. As governmental fleets have traditionally been the largest consumers of autos, these regulations have major repercussions on sales of autos and auto parts.

Provincial and local governments have also actively implemented the policy of "coordinative development" to attract investment by unifying the production chain within industrial clusters. Within industrial clusters, interconnected enterprises in a particular industry share related production inputs, specialized labor pools, distribution and communication channels, and network associations (Specialty Steel Industry of North America 2008).

To help China's automotive industry negotiate the global economic crisis, China's government has so far introduced two stimulus packages. The first, in January 2009, sought primarily to boost vehicle sales. Its range of policies included halving the purchase (sales) tax on cars with engines of less than 1.6 liters, providing large subsidies for rural residents to trade in old vehicles for new, and lowering retail fuel prices. The second package, announced in March 2011, included initiatives aimed at restructuring and strengthening the industry. It announced the goal of making "new energy" cars — which currently account for 5% of passenger-vehicle sales, and it backed up this target by offering funds for research into alternative energy and improvements in vehicle safety. The government is also encouraging auto-finance companies to loosen credit requirements and to lower interest rates. The package also reiterated the government's desire to consolidate the top 14 companies (including their in-house parts makers) into 10 major auto groups organized into two distinct tiers: Tier-1 companies with annual production capacity of 2 million units, and Tier-2 companies with annual production capacity of 1 million units.

Since 2000, Beijing has released at least three plans to consolidate the automotive industry with no discernable effect, as these plans have clashed with provincial interests (Haley and Haley 2007, 2012). For example, in 2000, Beijing released a plan to consolidate all of China's car manufacturers into the three biggest SOEs. Almost immediately, Anhui province's Chery, founded in 1997, began selling a mini car. Rather than force Chery to shut down, Beijing required it to sell 20% of its shares to Shanghai-based SAIC. Three years later, Chery bought back its shares from SAIC. In 2009, Chery sold more than 500,000 cars as China's largest stand-alone car manufacturer.

In addition, the 2009 stimulus plan states that domestic car makers will need to export 20% of total production. The plan also aims to increase the market share of domestic-branded passenger vehicles to 40% from the 34% in 2008. Toward its efforts to increase the R&D capabilities of China's automotive industry, the government has also mandated any newly approved auto projects to commit $60 million toward R&D. As stated earlier in this report, the government plans to set up production capacity for 500,000 NEVs and to increase market share of NEVs to 5% of total auto sales. The government is also continuing its financial and economic subsidies to the auto-parts industry.

In 2009, GM offered a glimpse of its R&D capabilities and cooperation with the Chinese government when it introduced the Chevrolet New Sail, which it developed entirely in China. The Pan-Asia Technical Automotive Center (PATAC) in Shanghai, a 13-year-old JV with GM's local partner SAIC, developed the product.

J.D. Power analyst John Zeng said GM is taking the lead among international automakers in product design and R&D in China.

"GM is the foreign brand that really has true R&D facilities in China," Zeng said, "so they can do local design to make their products more fitted to the market."

GM has begun exporting the New Sail to Chile (*Automotive News China 2011*). In February 2011, the company announced plans to introduce 20 new and upgraded models in China over the next two years as it expands into different segments. During a press conference in Beijing, GM's Chief Executive Officer Dan Akerson noted that by the end of 2011, GM would open the doors of its $150 million GM China Advanced Technical Center (CATC) in Shanghai for R&D on auto parts and autos (*Automotive News China 2011*).

"As an integral element of our global product development strategy, the [CATC] will create advanced technologies and lead GM's global research in targeted areas," said Kevin Wale, president and managing director of the GM China Group (GM Media 2010). "We expect it to become one of GM's most important and comprehensive technical and design facilities worldwide."

The CATC will incorporate 62 test and nine research labs, and hire more than 300 engineers and scientists. Its labs will include (1) the China Science Lab for R&D on advanced-propulsion systems, manufacturing processes, megacity smart traffic, customer-driven advanced vehicles, battery-cell material and fabrication, and lightweight materials; (2) the Vehicle Engineering Lab for R&D on electric vehicles, alternative-energy vehicles, battery technology in conjunction with Chinese suppliers, and product development featuring advanced technology and design solutions with GM's domestic JVs; and (3) the Advanced Powertrain Engineering Lab for R&D on advanced-propulsion systems, including electrification technology, alternatives to petroleum-based fuels in conventional powertrains, and unique conventional powertrains for the local market, as well as new materials for powertrain products. The new facility will complement GM's engineering and product development partnerships in China, including PATAC and the China Automotive Energy Research Center (CAERC) in Beijing. According to Wale, "As a global technology leader and the global industry leader in China, GM is committed to working with the Chinese government, industry partners, and the academic community in the development of tomorrow's vehicles" (GM Media 2010).

The Chinese central and provincial governments have implemented a raft of direct and indirect government subsidies to carry out their industrial policies. These governmental support measures include:

- direct subsidies to companies, including subsidized financing, cash grants, tax subsidies, export subsidies, interest-free loans, and R&D grants
- indirect subsidies to the industry, including governmentally controlled prices to energy, raw materials, and key inputs

According to Zheng Xinli (2010), deputy director of the Economic Committee of the National Committee of the Chinese People's Consultative Conference and former deputy director of the Policy Research Center of the CPC Central Committee, industrial upgrading, including in autos and auto parts, is an investment priority for the Chinese government. The 12th Five-Year Plan will see the government increasing its input into R&D and encouraging international mergers and acquisitions (M&A) to acquire foreign technology, he said. "Geely has outflanked FAW Group, DFAC [Dongfeng], and SAIC in middle- and-high-end automobile technology R&D through acquiring Volvo. Thus, we should make the most of international scientific and technological resources, and enhance our innovative capacity through M&A" (Zheng 2010).

China's four largest state-owned banks – Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), the People's Bank of China, and the Agricultural Bank of China – account for over 60% of all loans. In accordance with central or local governments' industrial policies, these banks have made loans based on political directives (or policy loans), rather than the borrowers' creditworthiness or other market-based factors. The Chinese government has instructed banks in China to provide loans to further its industrial policies on numerous occasions. In just one example, SAIC, China's largest automaker, received "huge amounts of bank credit for its market expansion" (*People's Daily Online 2000*). The Chinese government also has provided other companies in China's automotive sector with significant subsidies in the form of subsidized (or reduced-interest) loans for SOEs' strategic restructuring and technical transformation of key production technologies.

Subsidies to China's auto-parts industry

This section presents calculated subsidies provided both directly to companies in China's auto-parts industry, as stated in their annual reports, and indirectly to the industry as subsidies for coal, electricity, natural gas, glass, and cold-rolled steel, as revealed in policy statements. Descriptions of the data and methodology, as well as the mathematical equations to calculate the subsidies, can be found in the Appendix. As **Figure L** shows, discernible subsidies to China's auto-parts industry from 2001 to 2011 totaled at least $27.5 billion, a change of 90%. The Chinese central government has committed an additional $10.5 billion in subsidies for 2012 to 2020. Chinese government subsidies have increased steadily over the last decade, but rose most sharply after 2008, with a year-over-year increase of 125% from 2008 to 2009 alone. This increase is in line with Chinese policy statements and announced support for R&D in auto parts.

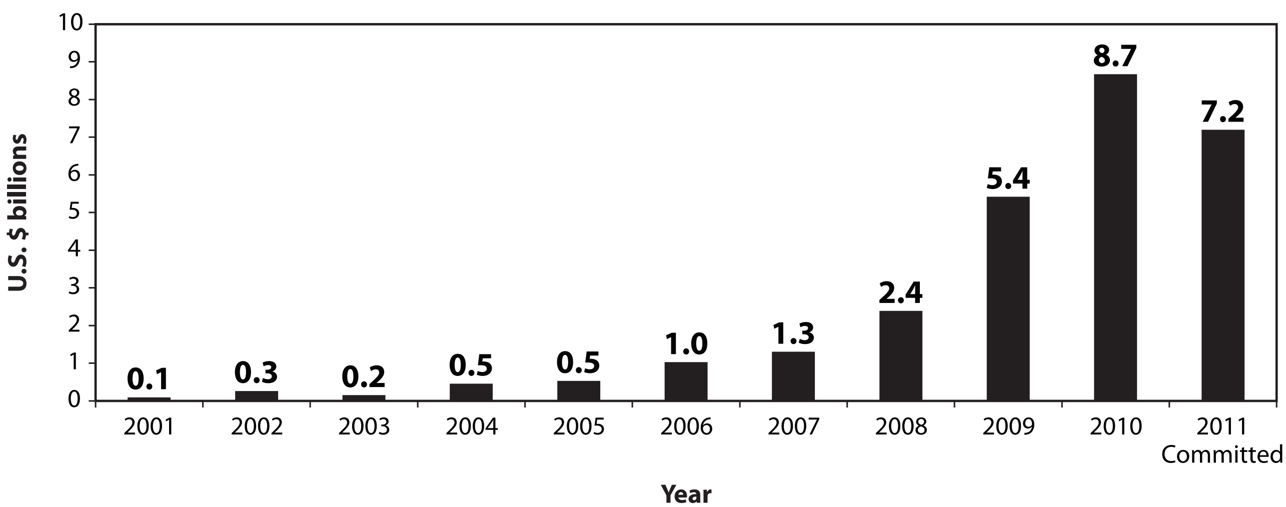
Because the calculations reported here include only those subsidies that could be traced, confirmed, and recorded, the total subsidies to the Chinese auto-parts industry in this report are likely to be conservative estimates. Missing data prevented calculation of subsidies across all years of the study and for the great majority of more than 10,000 registered Chinese auto-parts companies and 24 provinces that independently list the automotive industry as a pillar industry. The trend of rising subsidies explains to some extent why Chinese auto-parts sell for around 30–50% less than comparable auto-parts made in Europe, North America, or Japan despite rapidly rising raw-material prices. As mentioned earlier, labor accounts for only 5% of the costs of producing Chinese auto parts.

Subsidies reported by companies

Subsidies reported in the annual reports of China's auto-parts companies reached about $2.3 billion between 2001 and 2009. Only 73 companies out of more than 10,000 registered companies reported the subsidies they received. The companies reported subsidies as "subsidy

FIGURE L

Total identified subsidies to China's auto-parts industry, 2001–11



SOURCE: Author's estimates; see Figures M–R, text and appendix for details.

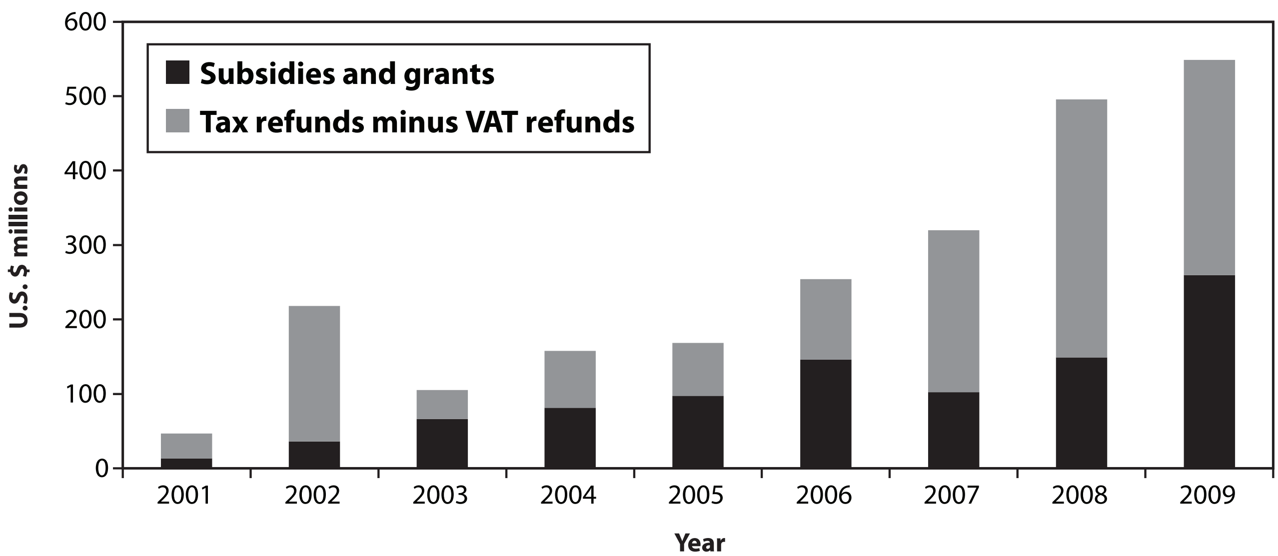
income" and "government grants" (without repayment terms), which amounted to $951 million; and as "tax refunds (minus VAT refunds)," which amounted to $1.36 billion. The great majority of these companies had no legal needs to disclose cash grants or subsidies from the government, and many of their managers probably misunderstood reporting requirements (see Yu 2009), so the reporting is sporadic with much missing data. **Figure M** indicates the presence of some reported subsidies in each year of the period shown.

Over the period of study, auto-parts companies benefited from a variety of subsidy programs if they satisfied export-performance requirements or purchased Chinese-made accessories and equipment, rather than imports. The subsidy programs included grants, policy-directed discounted loans, and other credit benefits from state-owned banks, income-tax benefits to foreign-invested firms, tariff exemptions, and income-tax refunds (Haley, U.C.V. 2007; Szamosszegi 2007). Generally, "subsidy income" in companies' annual reports included interest subsidies and investment subsidies that the companies received from central and provincial governments. Interest subsidies were the refunds by the Chinese governments of interest charged by banks to companies that were entitled to such subsidies. Investment subsidies were payments to encourage foreign investors to set up technologically advanced enterprises in China.

BYD, one of the world's largest manufacturers of rechargeable, lithium-ion batteries, and a company in which Warren Buffet invested $232 million in 2008 (Oliver 2008), demonstrates the effects of government subsidies on companies' operations. In 2008, BYD's released financial statements showed slim margins for all its products, including auto parts. Without the local government's reported subsidies, BYD's profits would have fallen by 26%. BYD used more than three-quarters of its subsidies and government grants for "automotive research and development," with the remainder paying interest on bank loans. The grant conditions did not specify any repayment terms. Most of BYD's grants and subsidies appeared to have come from its local Shenzhen city government, but the breakdown between Beijing's and Shenzhen's allocations remained unclear. State-run banks in Shenzhen had also lent generously to BYD without demanding collateral. BYD's unsecured bank loans stood at $1.3 billion by the end of 2008, with 77% of these loans as unsecured.

FIGURE M

Subsidies reported by China's auto-parts industry, 2001–09



SOURCES: Author's analysis of data from ISI Emerging Markets (2010–2011), and companies' annual reports (Chinese and English).

Subsidies for coal

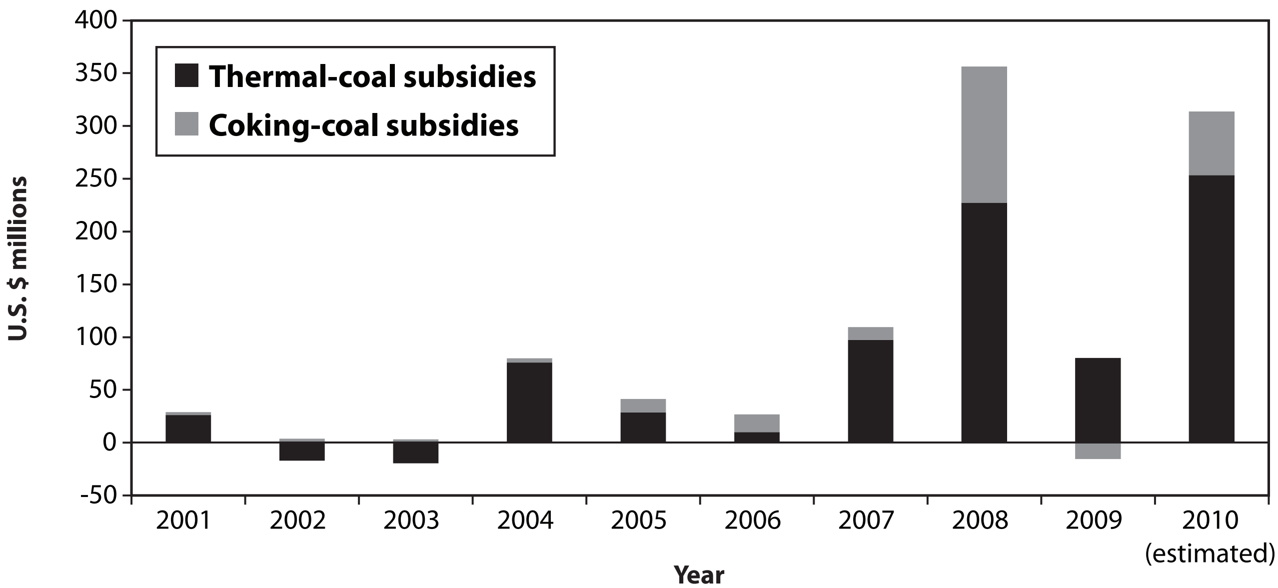
Subsidies for coal consumed by China's auto-parts industry totaled about $1 billion between 2001 and 2010. The total for thermal-coal subsidies approximated $76.3 million; the auto-parts industry is a small user of coking coal, and the total for these subsidies reached $23 million. **Figure N** indicates the presence of subsidies for thermal and coking coal. Subsidies for coal increased most steeply in 2008, when the price of thermal and coking coal soared.

Chinese subsidies for thermal coal have generally been used to offset shifts in world prices; the subsidies and prices rise and fall 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 auto-parts industry (whose calculations depend on market prices) may show the delays that transpire between producing coal (when demand increases) and getting it to market. Interviews with industry analysts indicate that in 2002 and 2003, China's auto-parts industry was paying a premium for thermal coal. Similarly, the Chinese auto-parts 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%.

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, U.C.V. 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

FIGURE N

Subsidies for coal used by China's auto-parts industry, 2001–10



SOURCES: Author's analysis of data from the International Energy Agency (2010–2011), Bloomberg (2010–2011), China Data Online (2010–2011), CEIC (2010–2011), Ward's Automotive Group (2010–2011), China Association of Automobile Manufacturers (2010–2011), *Mining Exploration News* (2010–2011), SteelontheNet (2010–2011).

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 U.C.V. 2008, 2009).

Subsidies for electricity

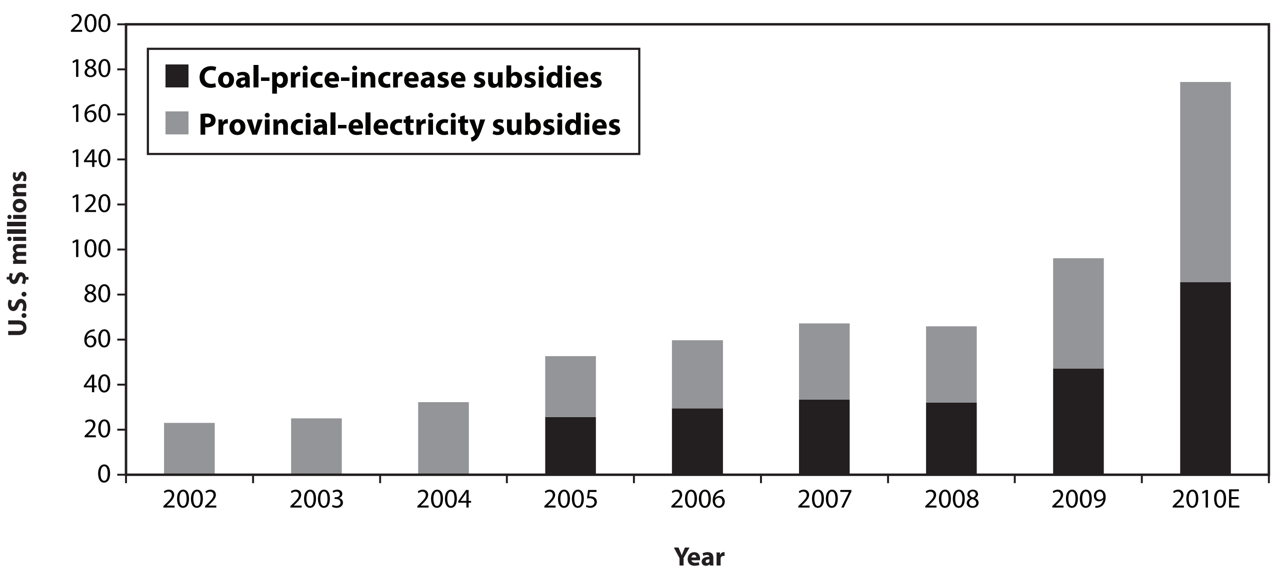
Subsidies for electricity used by China's auto-parts industry totaled $596 million between 2002 and 2010. The total for provincial subsidies approximated $343 million; the total for coal-price-increase subsidies, which took effect in 2005, was $253 million. **Figure O** indicates the presence of some 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 and Haley 2012 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 relies solely on published prices and the NDRC's disclosures on provinces that had subsidized their 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 3** 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 customers (Haley, U.C.V., 2009, 2010).

FIGURE O

Subsidies for electricity used by China's auto-parts industry, 2002–10



SOURCES: Author's analysis of data from the Australian Bureau of Agricultural and Resource Economics and Sciences (2010–2011), China Data Online (2010–2011), ISI Emerging Markets (2010–2011), Ward's Automotive Group (2010–2011), Interfax China (2010–2011b), National Bureau of Statistics, China (2010–2011).

TABLE 3

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

SOURCES: Derived from data provided by Australian Bureau of Agricultural and Resource Economics and Sciences (2010–2011), Interfax China (2010–2011b).

Subsidies for natural gas

Subsidies for natural gas to the auto-parts industry totaled about $311 million between 2004 and 2010. As **Figure P** shows, in prior years the auto-parts industry was paying a premium for natural gas, but in any case it does not constitute a major user of the resource.

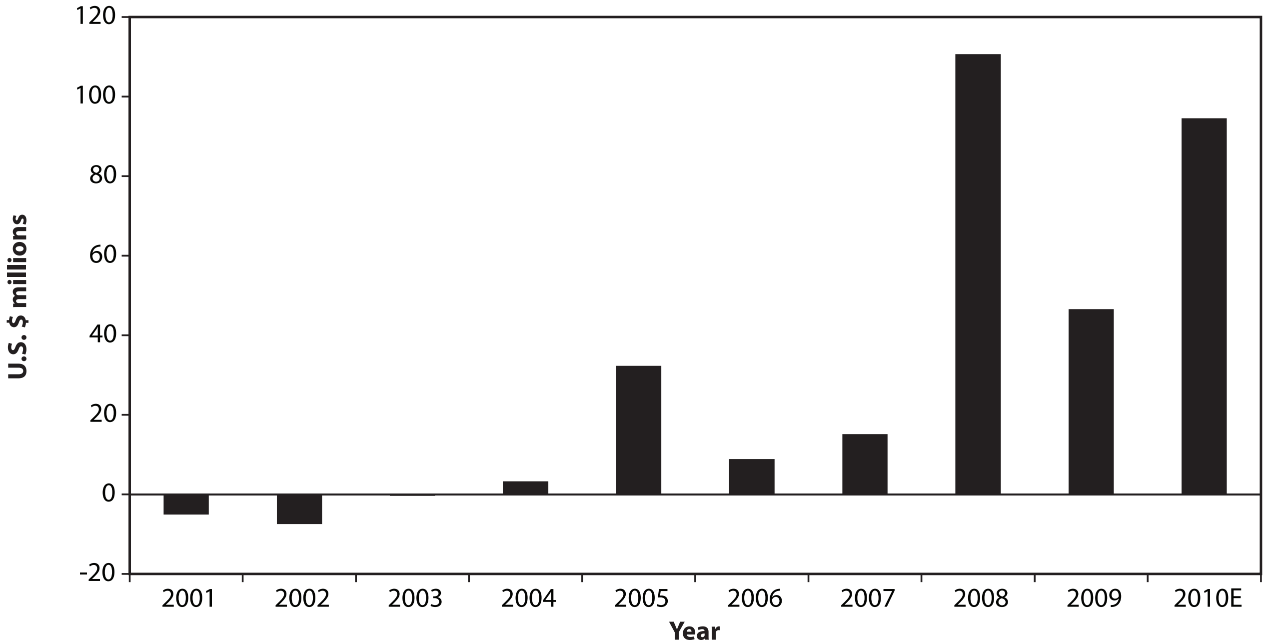
China's central government has tightly controlled natural-gas prices and attempted to keep gas prices for industry competitive with other developing countries. But this approach failed to induce the development or importation of sufficient quantities of natural gas to meet burgeoning demand. On December 22, 2005, the NDRC announced that it had changed the natural-gas pricing system and would allow a natural-gas price hike of 8% per annum. Consequently, natural-gas prices have increased and subsidies to this source of energy have increased as well. Although Beijing sets natural-gas prices, they vary by province and sector.

Subsidies for key inputs: glass and steel

As Table 2 outlined, the complex auto-parts industry serves as a major consumer for various upstream industries including raw materials and sub-components, each with their own cost structures and regulatory environments. This briefing paper concentrates on two major inputs – automotive glass and cold-rolled steel sheets. For an in-depth analysis of the structure and subsidies received by China's flat-glass and steel sectors, see Haley, U.C.V. (2008, 2009).

FIGURE P

Subsidies for natural gas used by China's auto-parts industry, 2001–10



SOURCES: Author's analysis of data from the International Energy Agency (2010–2011), CEIC (2010–2011), China.org.cn (2010–2011), China Data Online (2010–2011), ISI Emerging Markets (2010–2011), Ward's Automotive Group (2010–2011).

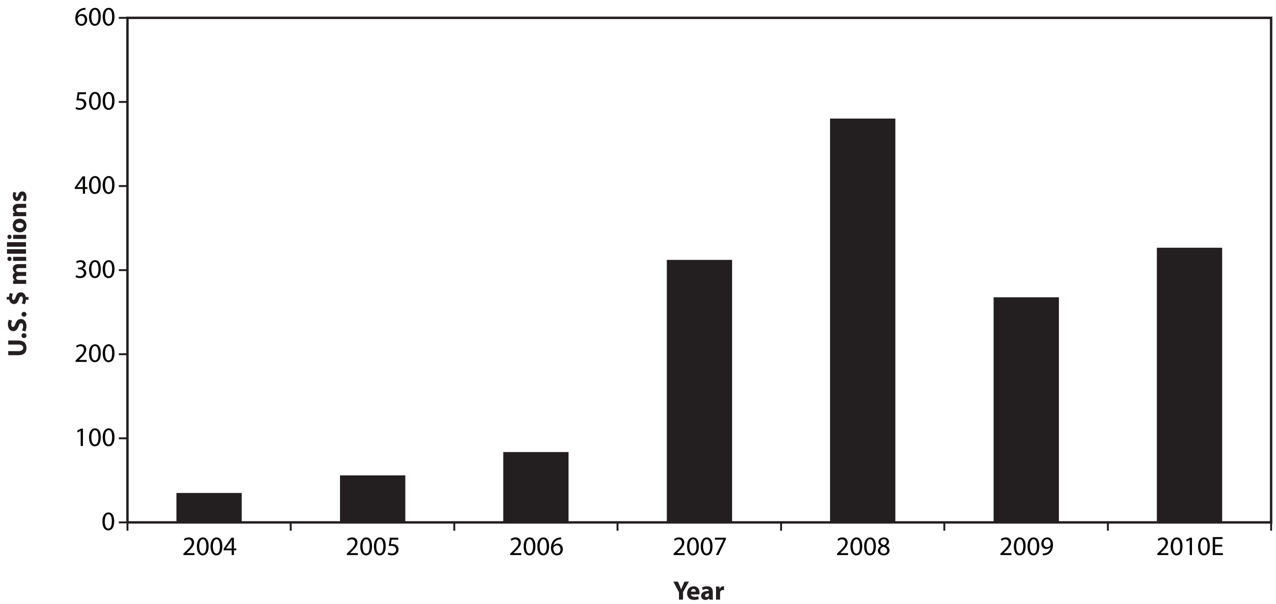
As **Figure Q** shows, subsidies for glass to the Chinese auto-parts industry approximated about $1.6 billion over 2004–2010. Fuyao Glass serves as China's largest automotive glass maker with over 50% of the market. As **Figure R** shows, subsidies for cold-rolled steel sheet totaled about $3.2 billion from 2003 to 2010. The auto-parts industry paid a premium for cold-rolled steel sheet in 2003. Additionally, despite a generally steady growth in subsidies for both glass and steel for the period under study, subsidies to both inputs fell in 2009 as the global financial crisis hit auto-parts sales and production. However, as production picked up in 2010, subsidies for both glass and cold-rolled steel picked up as well.

The Specialty Steel Industry of North America (2008) report described how the Chinese government provides raw materials to producers in key industries at preferential, subsidized prices. Testimony in 2007 before the U.S.-China Economic and Security Review Commission (USCC 2007, 40) also concluded that "[p]rovincial and municipal governments subsidize purchases of…raw materials…by requiring other SOEs or pressuring their own suppliers to provide these inputs at below-market or even below-cost prices" (Haley, G.T. 2007). In 2008, in countervailing duty investigations of products imported from China, the U.S. Department of Commerce found that the Chinese government confers substantial countervailable subsidies upon producers of downstream products for the provision of raw-material inputs at below-market prices (Specialty Steel Industry of North America 2008, 51).

Indeed, Article 32 of the revised 2009 AIP central-government plan for China's auto-parts industry reiterates government subsidization of downstream industries by stating: "Key support will be given to developing the capabilities of iron and steel manufacturers to supply sheet steel for sedans. Support will be given to the establishment of professional mould design and manufacturing centers so as to improve automobile mould design and manufacturing capabilities. Support will be given to petrochemical enterprise technological progress and product upgrading so as to cause the quality of such oil

FIGURE Q

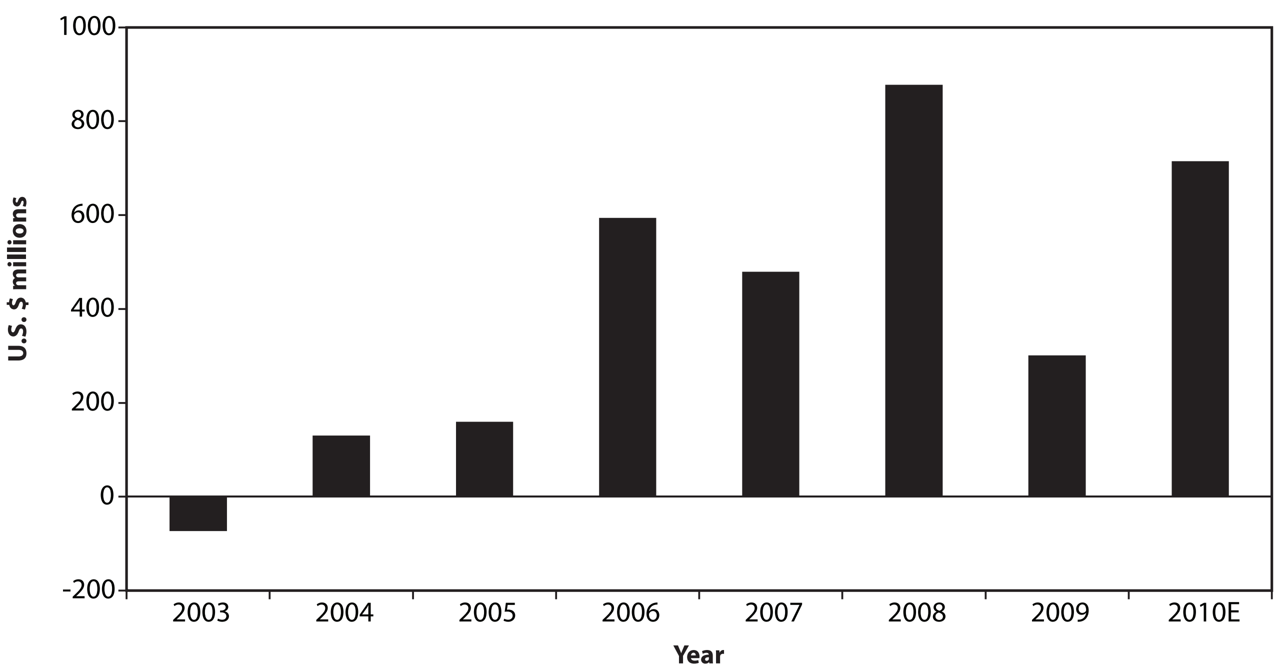
Subsidies for glass used in Chinese auto parts, 2004–10



SOURCES: Author's analysis of data from Credit Suisse/First Boston (2010–2011); SWS Research (2010–2011); Haley, U.C.V. (2009).

FIGURE R

Subsidies for cold-rolled steel used in Chinese auto parts, 2003–10



SOURCES: Author's analysis of data from MEPS (International) Ltd. (2010–2011), SteelontheNet (2010–2011), Ward's Automotive Group (2010–2011), China.org.cn (2010–2011), and Beijing Waterwood Technologies Corporation (2010–2011).

products as processed oil and lubricating oil to attain advanced international level and satisfy the development needs of the automotive industry."

Technology development and industrial restructuring subsidies

The Chinese central and seven local governments distributed about $18.4 billion in subsidies to the auto-parts industry through technology-development and industrial-restructuring policies from 2001 to 2011. **Table 4** shows the identified subsidies. In addition, the Chinese central government has already committed $10.9 billion for disbursement of technology-development and industrial-restructuring subsidies between 2012 and 2020.

In 2007, the automotive sector remained among the most R&D-intensive sectors in the world, with four auto companies, Toyota, Ford, DaimlerChrysler and General Motors, among the top 10 investors in R&D in the world across all sectors. In 2008, notwithstanding the worldwide decline in auto sales, global auto investments in R&D accounted for 16% of total spending. Indeed, R&D spending in the industry increased, but only by 0.6%. Toyota, Ford, and General Motors

TABLE 4

Governments' industrial restructuring and technology-development subsidies affecting China's auto-parts industry, 2001–20

	2001–11	U.S. dollar
Central	*Auto-industry revitalization plan (2009–11)*	$1,457,560,000
	Industrial-technology upgrades plan (2009)	2,915,120,000
	Development and production of new energy vehicles (2010–11)	3,828,000,000
	Advancement of manufacturing technologies (2009–11)	1,443,960,000
	863 plan of electric vehicles (2001–05)	96,647,200
	13 cities project (2009–10)	4,905,164
Local	*Jinan & Tangshan: E-auto battery subsidies (2010–11)*	7,908,606,666
	Shanghai: Power-station subsidies (2010–11)	22,419,975
	Shanghai: E-auto subsidies (2011)	151,462,000
	Hangzhou: Alternative-energy-vehicle purchase subsidy (2009–11)	127,385,451
	Hefei: Alternative-energy-vehicle purchase subsidy (2009–11)	128,594,712
	Beijing: Vehicle-purchase subsidy (2009–11)	303,583,800
	Chongqing: Road & bridge toll subsidy (2009–11)	6,693,708
	Kumming: Technology-enhancement subsidy (2009–11)	19,348,194
	Total	**$18,414,286,870**

	2012–20	
Central	*Development and production of new energy vehicles (2012–20)*	**$10,872,000,000**

SOURCES: Author's analysis of data from Netscribes (2010–2011), SWS Research (2010–2011), Fathom China Ltd. (2010–2011), and Sun (2010), and author's interviews with industry analysts.

continued among the top 10 investors (Jaruzelski and Dehoff 2007, 2009).

Understanding that investments in R&D underscore global competitiveness, the Chinese government's auto policies strongly encourage the development of cutting-edge and green research capabilities in the local supplier industry. For example, Beijing aims to have China's total annual production capacity of pure electric, plug-in, hybrid, and other NEVs reach 500,000 units by 2011 (ITA 2009); as indicated previously in this report, the NDRC has stated that auto-parts companies in China may have greatly exceeded that production target one year earlier, in 2010. To establish global competitiveness, Chinese policies have attempted (1) to build capabilities through domestic R&D, and (2) to attract foreign direct investment (Zhongxiu and Zhi, 2009). The government views technological development and industrial restructuring in the automotive sector as prime drivers for the entire Chinese economy, including several commodity and service-related sectors such as machinery, rubber, petrochemicals, electronics, glass, steel, textiles, auto financing, and auto-distribution channels.

Most local companies' R&D efforts, including industrial leaders such as BYD, fall short by global standards. For example, BYD's founder, Wang Chuanfu, stated that in the development of new products, BYD had learned 60% from public documents, 30% from finished products, and just 5% from BYD's own R&D. "Our creativity comes from picking out the patented parts of technology and putting together the parts that are not patented" (GaveKal Dragonomics 2009). Consequently, the Chinese central and local governments see as their priority providing enormous support to local companies to improve industrial processes, circumvent patents, acquire technology, and copy competitors to catch up.

Local content, counterfeiting, and foreign acquisitions

Foreign companies and governments have been affected by several major issues concerning the production of Chinese auto parts and the subsidies that fuel their production. This report concludes by focusing on three issues: local content, counterfeiting, and M&A.

Local content

The International Trade Administration (2009) has stated that the Chinese government's auto policies, including automotive-related R&D activities, strongly encourage the development of the local supplier industry. Yet, according to the Chinese government, since China's accession to the WTO, Chinese bureaucrats have worked hard to remove all WTO-forbidden local-content requirements from legislation. Officially, Chinese law contains no local-content requirements either regionally or nationally in any sector. The reality in the auto-parts industry appears somewhat different.

In spring 2006, the United States, the European Union, and Canada requested WTO dispute settlement with China regarding regulations on imported auto parts. The countries argued that China's auto-parts tariff classifications resulted in higher tariffs than China agreed to in its WTO accession agreement, and discouraged auto manufacturers in China from using imported auto parts. Chinese regulations imposed the same tariff rates for vehicles on imported auto parts if the imported parts exceeded a fixed percentage of the final vehicle content or vehicle price, or when specific combinations of imported auto parts were used in the final vehicles. The tariff on automobiles is typically 25%, and the tariff on imported parts is typically 10%. In 2008, China appealed the WTO's ruling that China must bring its import tariffs for foreign auto parts into compliance with international trade rules. However, in December 2008, the WTO rejected China's appeal. In September 2009, in response to the WTO's ruling, China eliminated the additional charges on imported auto parts (ITA 2009).

In 2011, Beijing has removed tariff barriers, yet non-tariff barriers continue in the Chinese auto-parts industry. Specifically, local-content requirements continue unofficially and informally, especially in the provinces, as *Neibu* — undisclosed rules for the approval of foreign-investment projects. *Neibu* exists alongside *Gongkai* or public regulations (OECD 2003). For autos and auto parts, project loans from Chinese policy banks and provincial governments have become contingent on foreign companies' willingness to commit to local content. Reports refer to a secret 60% rule under which foreign companies must have 60% local content to obtain state grants, bank loans, and even access to provincial markets.[12] In 2002, Beijing enacted "The Government Procurement Law of the People's Republic of China," which continues to influence purchasing by SOEs, especially in projects that require government investment. In 2009, as China began to disburse $586 billion as economic stimulus, the NDRC and eight other ministries jointly released Circular 1361[13]: "Government investment projects should purchase domestic products, unless these domestic goods, construction, engineering, or services are not available in China or cannot be acquired on reasonable commercial terms. Projects requiring imported products will need prior approval from relevant government authorities."

Although never officially recognizing the existence of local-content regulation, the Chinese government has used other regulation as well as inducements to enforce content agreements from foreign companies. A 2007 NDRC circular, "Suggestions Concerning Structural Readjustment of the Automotive Industry," stated: "Sino-foreign joint ventures should be engaged in activities in accordance with the terms of the contracts signed by both parties and approved by the government. Those who fail to fulfill what is required in the contracts should correct their actions in a timely manner. If no correction is made, construction of any new plant will be temporarily halted and any application for the promotion of new products will also be suspended."

Foreign auto assemblers have to fulfill product feasibility requirements, and Chinese government officials have classified foreign companies' new products as unfeasible for failing to honor any part of the local-content agreements they had signed. An official involved in drafting the rules on foreign companies' new-product-feasibility reports said: "In the feasibility report on a new product, localized production is a core requirement" (quoted in Liao 2007).

Foreign companies have responded to Chinese persuasion on local content. In 2006, Helmut Panke, BMW's chief executive officer, went to Beijing twice for secret talks with Bo Xilai, China's minister of commerce. Soon after, Eberhard Schrempf, BMW-Brilliance's president and CEO, announced that BMW would expand local production in China, with local sourcing to increase from $111 million in 2005 to $384 million by 2006. The company also said that it would increase the number of local suppliers from 45 to 83 over the same period. In May 2006, Till Becker, DaimlerChrysler Northeast Asia's chairman and CEO, declared that Beijing Benz-DaimlerChrysler would increase local sourcing in China from $100 million to $840 million within two years on its locally produced cars. In response, in July of the same year, the General Administration of Customs of China announced that it would postpone the date to introduce the rules on completely knocked-down (CKD) auto-parts imports, from July 1, 2006 to July 1, 2008 (Liao 2007).

Counterfeiting

Chinese counterfeited auto parts pose big problems for U.S. and other foreign companies' worldwide strategies. Frost & Sullivan estimated that worldwide, counterfeit auto parts would generate sales of $45 billion in 2011, up from $12 billion in 2008. According to the Japan Auto Parts Industries Association, more than 83% of those counterfeited auto parts came from China. Chinese counterfeiters typically copied high-volume aftermarket parts such as spark plugs, oil filters, brake pads, and steering parts, although complex, counterfeited parts such as air bags had also become common. In 2011, TRW Automotive estimated losing more than 20% of the Chinese market to counterfeit brake pads, air bags, and rotors. In 2011, Corteco China sold 5% of the 30 million aftermarket oil seals sold annually in China but estimated that, without counterfeits, its market share would have risen to 25%. Corteco's oil seal costs 45 yuan, but a fake Chinese oil seal, which incorporates low-grade rubber and metals that caused leaks and made cars unstable, costs 20 yuan. In 2010, Chinese government officials shut down a factory in Guangzhou that produced fake Corteco oil seals and that had actively manufactured for over a decade. Corteco stated that the Chinese government had closed the counterfeiter every year, and it had almost immediately returned stronger and more sophisticated. In 2008, the counterfeiter had annual production capacity of 7 million oil seals; in 2011, the counterfeiter had raised annual production capacity to 10 million oil seals (Chow 2011). Many of these counterfeiters had received subsidies and support from local governments. As a response, foreign companies have started marking their auto parts with radio frequency identification tags; over 90% of TRW's products will have them. Foreign companies have also formed the Quality Brands Protection

Committee to fight counterfeiters by working with local governments and police to shut down factories, but strategies so far have proven ineffectual.

In March 2011, U.S. diplomatic cables revealed by WikiLeaks provided a glimpse of BYD's violations of copyrights. "While BYD has certainly achieved a measure of success based on a business approach of copying and then modifying car designs just enough to convince Chinese courts that the company has not infringed on patents, it is far less certain that foreign courts will be as sympathetic," Guangzhou Consul-General Brian Goldbeck wrote in an October 30, 2009 cable marked for U.S. government eyes only (quoted in Berkowitz, Krolicki and Yee 2011). According to the U.S. consulate, the company also sold some vehicles at cost to boost its market share and may have advertised safety ratings that it did not have. BYD, which has received large subsidies from the Shenzhen government, has effectively used price as a tool to achieve market share. The U.S. consulate's cables indicate that BYD sold one model for a profit of less than $146 per car, yet BYD continued to attract foreign JV partners. In early March 2011, the Chinese government approved a JV between BYD and Daimler AG. For Daimler the JV appeared to provide a low-risk way to hedge against future regulations. A source familiar with Daimler's side of the negotiations said that the German automaker signed the deal fully aware of BYD's reputation. Auto-parts companies have also expressed concerns about BYD stealing technology. Specifically, U.S. auto-parts manufacturers have complained that BYD would "ask for an initial order of parts like door panels, then drop the business, reverse engineer the part and use it on upcoming models" (Berkowitz, Krolicki and Yee 2011).

Chinese M&A in the United States

In addition to imports, U.S. auto-parts companies are facing significant competition from overseas suppliers who have built plants in the United States and are now competing inside the market with traditional U.S. suppliers.[14] Indeed, the percentage of auto parts from new U.S.-based domestic suppliers jumped from 12% in 1997 to 35% in 2010.[15] The Chinese are among the fastest growing of these new domestic suppliers. One major goal remains the transfer of technology back to China. U.S. auto and auto-parts companies are assisting Chinese companies with engineering and technical expertise and also selling them factory equipment. Consequently, competitive Chinese auto-parts companies are looking to manufacture and sell in the United States in close proximity to their U.S. mentors.

One such company, Wanxiang America, is a subsidiary of Wangxiang Group, partially owned by the Xiaoshan municipal government in China. Wanxiang America produces bumpers, bearings, joints, and transmission parts for auto manufacturers including GM, Ford, Chrysler, and Toyota. The company manufactures in China to avoid the United States' higher production costs, and the American subsidiary focuses on processing and assembly. In 1995, Wanxiang America had about $3.5 million in sales; in 2010, it had about $2 billion in sales. Wanxiang America has aggressively pursued M&A. Ni Pin, Wanxiang America's CEO, said, "We can provide value to those assets we purchase and help them stabilize and refresh their structure to grow," adding that M&A has become the company's "business model" (quoted in Yuwei 2011). Wanxiang's strategy appears both opportunistic and planned. Often the company buys bankrupt companies or those with liquidity problems. Paul Cumberland, Wanxiang America's investment director, said, "We've done everything from buying individual (privately owned) companies to buying a division of a really large company – deals ranging from $30–$40 million to $300 million" (quoted in Yuwei 2011). Since its establishment in 1994, Wanxiang America has acquired more than 20 U.S. businesses in several states including Illinois, Michigan, and Missouri, and it averages about two or three acquisitions every year. For example, in 2007, Wanxiang America acquired Dana Corporation's North American coupled-products business, then under Chapter 11 bankruptcy protection; in 2008, Wanxiang's Pennsylvania-based affiliate, Neapco LLC, bought Ford's drive-shaft business; in October 2010, Wanxiang America acquired 51% of D&R Technology, a 13-year-old automotive-sensor manufacturer in Carol Stream, Ill., and a former supplier to the company (Yuwei 2011). Other Chinese auto-parts companies have followed suit with similar M&A. For example, in April 2009, U.S. parts maker Delphi confirmed the sale of its brake and suspension divisions to BeijingWest Industries for $100 million (*China Daily* 2009).

*—**Usha C. V. Haley** is chaired Professor of International Business at Massey University, Auckland, New Zealand and Research Associate with the Economic Policy Institute. Readers with questions about the data and sources used for this report, or other matters, may contact the author at whaley@asia-pacific.com, Tel/Fax 1-212-208-2468 and http://usha.tel. This is the final report in a series of EPI studies on Chinese subsidies by Haley. More information on her research on Chinese subsidies is available at http://www.ChinaSubsidies.com.*

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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 value-added tax (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.[16] A report on Chinese subsidies by the Specialty Steel Industry of North America highlighted some problems with obtaining valid and reliable data on the issue. "Obtaining information regarding the nature and type of assistance received by Chinese producers is complicated, because corporate reporting in China is limited and often unavailable, particularly from SOEs. Indeed, a report issued by the Office of the U.S. Trade Representative has described the difficulty of obtaining information regarding Chinese support measures as follows: 'China's subsidy programs are often the result of internal administrative measures that are not publicized. Sometimes they take the form of income tax reductions or exemptions. They can also take a variety of other forms, including mechanisms such as credit allocations, low interest loans, debt forgiveness, and reduction of freight charges.' Accordingly, due to the lack of publicly available information in China, the beneficiaries of subsidies granted by the Chinese government are not identified, in most instances, in this report" (Specialty Steel Industry of North America 2008, 33).

For this analysis, and drawing on our previous work in the area, George Haley and I used data from multiple reliable sources across China, Hong Kong, the United States, Mexico, Taiwan, the United Kingdom, and Australia, including Chinese government agencies (such as the China Association of Automobile Manufacturers), Chinese officially sponsored think tanks (such as the China Automotive Technology & Research Center), U.S. government agencies (such as the International Trade Administration), international agencies (such as the International Energy Agency), international investment houses (such as Rodman & Renshaw), individual companies (such as Fuyao Glass), and focused market information companies (such as J.D. Power and Associates). (More information on these sources can be found in the references section at the end of this paper). We cross-checked data against at least two sources when possible, and when discrepancies arose we used the most conservative data. We checked estimates against accounting data provided by individual companies and interviews with managers as well as discarded ill-defined data.

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 (*Economist* 2007). Multiple prices in one economy (as exists in China) can also affect the estimation of end-user prices. This briefing paper uses official exchange rates for the years in question; the reference prices were industry-specified world prices for natural gas, coking and thermal coal, glass, and cold-rolled steel as indicated by industry practice.[17]

Measurement of variables

This briefing paper identifies and measures subsidies to the auto-parts industry in China, specifically to subsidies reported by companies, coal, electricity, natural gas, glass, and cold-rolled steel, and government subsidies for industrial restructuring and technology development. The mathematical equations to calculate subsidies follow:

1. Subsidies reported in companies' annual reports (CS_{ap}):

$CS_{ap} = \sum_{yr}^{2009} (SI_{yr} + GG_{yr} + TR_{yr})$ where:

CS_{ap} = Total subsidies reported in 73 auto-part companies' annual reports

SI_{yr} = Subsidies reported as subsidy income in annual reports from 2001 to 2009

GG_{yr} = Subsidies reported as government grants in annual reports from 2001 to 2009

TR_{yr} = Subsidies reported as tax refunds (less VAT refunds) in annual reports from 2001 to 2009

2. Thermal coal subsidies (T_{cap}):

$T_{cap} = \sum_{yr}^{2010} ((WPT_{yr} - CPT_{yr}) KT_{yr})$, where:

T_{cap} = Total subsidies paid to auto-parts industry for thermal coal

WPT_{yr} = World price of thermal coal in each year from 2001 to 2010

CPT_{yr} = Chinese price for thermal coal in each year from 2001 to 2010

KT_{yr} = Kiloton usage in the Chinese auto-parts industry of thermal coal in each year from 2001 to 2010

3. Coking coal subsidies (C_{cap}):

$C_{cap} = \sum_{yr}^{2010} ((WPC_{yr} - CPC_{yr}) KC_{yr})$, where:

C_{cap} = Total subsidies paid to auto-parts industry for coking coal

WPC_{yr} = World price of coking coal in each year from 2001 to 2010

CPC_{yr} = Chinese price for coking coal in each year from 2001 to 2010

KC_{yr} = Kiloton usage in the Chinese auto-parts industry of coking coal in each year from 2001 to 2010

4. Electricity coal-price increase subsidy (CPI_{ap}):

$CPI_{ap} = \sum_{yr}^{2010} (S_{yr} \times APEU_{yr})$, where:

CPI_{ap} = Total benefits to auto-parts industry for coal-price subsidy paid to electricity generation industry

$APEU_{yr}$ = Electricity usage by auto-parts industry in each year from 2005 to 2010

S_{yr} = Coal-price increase subsidy rate in each year from 2005 to 2010

5. Provincial electricity subsidies (PE_{ap}):

$PE_{ap} = \sum_{yr}^{2010} (APkwh_{yr} (EU_{yr} \times APEU_{yr}))$, where:

PE_{ap} = Total benefits to auto-parts industry by provinces' electricity subsidies

EU_{yr} = Total electricity usage of auto-parts industry in each year from 2002 to 2010

$APEU_{yr}$ = Percent of kilowatt usage by auto-parts industry in electricity subsidizing provinces in each year from 2002 to 2010

$APkwh_{yr}$ = Provincial-electricity subsidy rate in each year from 2002 to 2010

And $APEU_{yr}$ is determined by:

$APEU_{yr} = \sum_{yr}^{2007} ((6((AP_{yr} - TAPIP_{yr})/APP_{yr}) + TAPIP_{yr}) / TAP_{yr})$, where[18]:

TAP_{yr} = Total auto-parts production in all 30 provinces producing auto parts

$TAPIP_{yr}$ = Total auto-parts production in eight provinces producing auto parts identified as paying electricity subsidies

APP_{yr} = Auto-parts-producing provinces in each year less the eight provinces identified as paying subsidies and producing auto parts

6. Natural gas usage subsidies (NG_{ap}):

$NG_{ap} = \sum_{yr}^{2010} ((USP_{yr} - CP_{yr})\ SG_{yr}))$, where:

NG_{ap} = Total natural-gas subsidies paid to auto-parts industry

USP_{yr} = U.S. price of natural gas in each year from 2001 to 2010

CP_{yr} = Chinese price of natural gas in each year from 2001 to 2010

SG_{yr} = Natural-gas usage by Chinese auto-parts industry in each year from 2001 to 2010

7. Glass subsidies (GS_{ap}):

$GS_{ap} = \sum_{yr}^{2010} GU_{yr}(CGC_{yr} - WGC_{yr})$, where:

GS_{ap} = Total glass subsidies to auto-parts industry

GU_{yr} = Glass usage in each year from 2004 to 2010

CGC_{yr} = Chinese costs per tonne of flat glass in each year from 2004 to 2010

WGC_{yr} = World costs per tonne of flat glass in each year from 2004 to 2010

8. Cold-rolled steel subsidies ($CRSS_{ap}$):

$CRSS_{ap} = \sum_{yr}^{2010} CRSU_{yr}(CCRSP_{yr} - WCRSP_{yr})$, where:

$CRSS_{ap}$ = Total cold-rolled steel subsidies to auto-parts industry

$CRSU_{yr}$ = Cold-rolled steel usage in each year from 2003 to 2010

$CCRSP_{yr}$ = Chinese costs per tonne of cold-rolled steel in each year from 2003 to 2010

$CRSU_{yr}$ = World costs per tonne of cold-rolled steel in each year from 2003 to 2010

9. Technology development subsidies (TDS_{ap}):

$$TDS_{ap} = \sum_{yr}^{2011} (TDSAC_{yr} + TDSAL_{yr}), \text{ where:}$$

TDS_{ap} = Total reported governmental technology-development subsidies for auto-parts industry

$TDSAC_{yr}$ = Technology-development subsidies announced by central government for Chinese auto-parts industry for period 2001–11

$TDSAL_{yr}$ = Technology-development subsidies announced by seven local governments for local auto-parts industries for period 2001–11

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

Endnotes

1. According to the European Automobile Manufacturers' Association (2010), in 2009, of 47.5 million passenger cars produced worldwide, the European Union produced 29.5%, but China led among nations with 22%, followed by Japan with 14.5%. NAFTA countries (the United States, Canada, and Mexico combined) produced 8.5% of the world's passenger cars. Light trucks in the United States constitute a higher proportion of vehicle production than in other countries.
2. Technology transfer in the automotive sector has not always achieved success. See Haley, Haley, and Tan (2004) for interviews with Beijing Jeep's senior managers on their experiences.
3. See Haley, G.T. (2007, 2009) for some of the constraints facing foreign auto and parts makers in China.
4. Author's interviews with industry analysts, Haley and Haley (2007, 2008).
5. Bo Andersson, group vice president in charge of GM's global purchasing and supplier chain, said that 90% of the materials and parts in a Chinese-made GM car were sourced locally, and of that 60% came from foreign companies and 40% from local Chinese companies (Zubko 2008).
6. Author's interviews with industry analysts and experts.
7. Author's interviews with industry analysts and experts.
8. Author's interviews, KPMG (2010–2011), and IBISWorld (2010–2011).
9. In contrast, research conducted by the author indicates that managerial and labor wages make up about 15% of auto-parts costs in the United States, not accounting for productivity differences between the United States and China, which remain substantial.
10. The author's independent research revealed that, for 2010, using depreciation as a proxy for capital, and wages as a proxy for labor, the capital-to-labor intensity for auto-parts production in China approximated 1:2, meaning that the average company in this industry required two units of labor for each input of capital.
11. See Haley and Haley (2012) and Haley, Haley, and Tan (2004) for how the policymaking process in China and differences of interests between the center and provinces affect subsidies.
12. Nancy Leigh, partner, Baker & McKenzie, Hong Kong.
13. "Opinions on the Implementation of Decisions on Expanding Domestic Demand and Promoting Economic Growth and Further Strengthening Supervision of Tendering and Bidding Projects," Circular 1361, May 27, 2009.
14. The author is indebted to Dennis DesRosiers (DesRosiers Automotive Consultants, Ontario, Canada) for this observation.
15. Data from Dennis DesRosiers (DesRosiers Automotive Consultants, Ontario, Canada), obtained March 10, 2011.
16. For a more detailed discussion of the problems surrounding data collection in China subsidies research, see U.C.V. Haley 2009, 2010. For the "black hole" of strategic information deliberately created by governmental policies in China and East Asia, see Haley, Haley, and Tan 2009.
17. For the methodology used to calculated subsidies to glass, please see U.C.V. Haley 2009.
18. Six provinces are paying electricity subsidies but have not been specifically identified by the NDRC; 22 auto-parts-producing provinces have not been specifically identified as paying electricity subsidies by the NDRC.

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