
Subsidies to Chinese Industry

*State Capitalism, Business
Strategy, and Trade Policy*

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Our industry study on steel subsidies draws on our earlier unpublished Alliance for American Manufacturing report; and our industry studies on glass, paper, and auto-parts subsidies draw on our earlier Economic Policy Institute briefing papers to inform the trade debate. These industry studies have benefited from reviews from academics and also from policymakers, US senators and representatives, trade lawyers, labor-union leaders, managers, and industry and country analysts.

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CHAPTER 1

The Hidden Advantage of Chinese Subsidies

China provided “easy access to capital,” Michael McCarthy, director at Evergreen Solar, told us on a wintry February morning as the company started moving all production of solar panels from Massachusetts to a joint venture (JV) in Wuhan, China. “We need capital to expand and grow. That is fundamental.” Earlier, in January 2011, Evergreen Solar had closed its main US factory and laid off 800 workers. In the previous three years, with the Massachusetts government’s loans and tax credits and its proprietary technology, Evergreen had become the United States’ third-largest solar-panel manufacturer. The company cited plunging solar-panel prices worldwide, coupled with much higher Chinese government subsidies (financial transfers from the government that provided benefits) as reasons for its move.¹

The Chinese had become the largest manufacturers and price setters in the nascent solar photovoltaic industry, accounting for over half the world’s production in 2010. World prices had fallen by two-thirds in the last three years. Evergreen’s CEO, El-Hillow, told the *New York Times* that the Chinese governments’ and state-owned banks’ considerable subsidies had helped Chinese manufacturers to keep costs very low (Bradsher 2011a). In 2010, the top five solar companies in China had received over \$31.3 billion in loans from the state-owned China Development Bank alone (Mercom).² El-Hillow said that the Chinese were now offering him similar massive subsidies that would keep Evergreen competitive; these subsidies, rather than low Chinese labor costs, influenced his move, he elaborated, as labor formed just a tiny part of his manufacturing costs. China’s real advantage, he said, lay in the ability of solar-panel companies

to partner with local governments and to obtain loans at very low interest rates from state-owned banks. Evergreen, with its partners, the Wuhan municipal and Hubei provincial governments, borrowed two-thirds of its Wuhan factory's costs (as compared to less than 5 percent of its US factory's costs from the Massachusetts government) from two Chinese state-owned banks at very low interest rates with no principal or interest payments due until the end of the loan in 2015. "Therein lies the hidden advantage of being in China," El-Hillow said (Bradsher 2011a).

This book provides a theoretical basis and an empirical analysis for understanding the hidden advantage of Chinese production subsidies with practical implications for world industry. Rather than aberrations, in China subsidies form central parts of what Fligstein (2001) called "conceptions of control," important ways in which Chinese businesses and governments produce, stabilize, and create common understanding of their markets. Flows of subsidies reflect interactions and struggles between critical Chinese actors such as central and provincial governments and state-owned enterprises (SOEs) with different resources, interests, and visions of markets. As we describe in later chapters, Evergreen's story has resurfaced across other industries, including steel, glass, paper, and auto parts. In all these capital-intensive industries where labor costs play minor roles, and in the space of approximately five years, China rose from a net importer to among the largest producers and exporters in the world. How did subsidies aid China in becoming so apparently competitive in capital-intensive products for which it enjoyed no comparative advantage³ a decade prior? What are the implications for firms and other countries in the face of this hidden advantage? Table 1.1 indicates the growth of three measurable subsidies to Chinese private firms and SOEs in the form of research-and-development (R&D) funds, subsidies to loss-making SOEs, and additional appropriations for SOEs' circulating capital, as reported by China's National Bureau of Statistics (NBS). From 1985 to 2005, these reported subsidies totaled \$310.18 billion.

China's modern global rise began more than three decades ago in 1976, when Deng Xiaoping took over as China's paramount leader after Mao Zedong. Deng's vision for China's restructuring included "socialism with Chinese characteristics," where the state continued to retain ultimate control of China's economic and political environments as it opened up to the world (Communist Party of China 2007). Analysts and researchers have credited Deng's policies as transforming Mao's restrictive and failed state-control model into one that could operate effectively in a global, capitalist economy (Spence 1997). In December 2001, in line with Deng's reforms, and after 15 years of diplomatic negotiations, China became a

Table 1.1. REPORTED SUBSIDIES TO CHINESE MANUFACTURING ENTERPRISES, 1985–2005 (BILLIONS OF DOLLARS)

	Innovation and technology subsidies	Subsidies to loss-making SOEs	Subsidies for SOEs' circulating capital	Total
1985	3.52	17.27	0.49	21.28
1986	3.76	9.41	0.29	13.46
1987	3.36	10.11	0.32	13.79
1988	4.06	12.00	0.26	16.32
1989	3.89	15.91	0.32	20.12
1990	3.22	12.10	0.23	15.55
1991	3.40	9.59	0.25	13.24
1992	4.06	8.07	0.19	12.32
1993	7.31	7.14	0.32	14.77
1994	4.82	4.25	0.20	9.27
1995	5.92	3.93	0.42	10.27
1996	6.29	4.06	0.52	10.87
1997	7.76	4.45	0.63	12.84
1998	7.75	4.03	0.51	12.29
1999	9.25	3.50	0.68	13.43
2000	10.45	3.37	0.86	14.68
2001	11.98	3.63	0.27	15.88
2002	11.70	3.14	0.23	15.07
2003	13.21	2.74	0.14	16.09
2004	15.03	2.63	0.15	17.81
2005	18.25	2.36	0.22	20.83
Total	158.99	143.69	7.50	310.18

Source: Compiled from China Statistical Yearbook; Girma et al. 2009.

member of the World Trade Organization (WTO) (BBC News 2001). In a front-page editorial, China's state-owned newspaper, *People's Daily*, labeled WTO membership as a "historic moment in China's reform and opening-up and the process of modernization" with prophetic hopes that China's manufacturing and exports would become even more competitive globally. In 2009, China surpassed Germany to become the world's largest exporter (Haley 2010). In 2010, China became the second-largest producer in the world, overtaking Japan. In 2010, Chinese foreign-exchange reserves also topped \$2.85 trillion, the largest in the world (Bradsher 2011b). In December 2010, only the United States and Japan exceeded China's patent filings; with 16.7 percent annual growth from 2006, in 2011 China surpassed the United States to become the top patent filer in the world (Yee 2011; Zhou and Stenbridge 2010).

In 2011, Chinese labor wages, though rising, still constituted about one-fifteenth of labor wages in the United States and other industrialized countries.⁴ Yet China's economic growth has speedily transcended its historical base of labor-intensive industries to capital-intensive industries. Rodrik (2006) showed that China's exports have significantly more sophistication and contain more high-tech goods than pure comparative-advantage arguments predict. He argued that China's industrial policies of "promotion and protection" shaped its industrial structure and exports. Much of China's economic prowess has manifested in the space of a decade, with many Chinese products selling for about 30–50 percent less than comparable products from industrialized nations. Economic theories of cost advantages from efficiencies and technological breakthroughs fail to explain fully these cost advantages: As the industry studies in this book indicate, Chinese industries remain highly fragmented, with most companies having no economies of scale or scope and using antiquated technologies. The next section highlights some of the unique characteristics of Chinese state capitalism. The ensuing sections provide brief reviews of economic and sociopolitical reasons for subsidies to enable moving beyond pure comparative advantage as an explanation for China's economic rise and global economic effects.

STATE CAPITALISM WITH CHINESE CHARACTERISTICS

State capitalism refers to situations where states play significant and visible roles in markets. Polanyi (1944; Polanyi, Arensberg, and Pearson 1957) identified states and markets as the two central, interconnected pillars of modern capitalism. Subsequent research elaborated on the state's roles in modern industrialized societies (e.g., Wallerstein 1979; Hobson 1997; Weiss 1998; Evans, Rueschemeyer, and Skocpol 2002). Focusing on Japanese institutional arrangements, Johnson (1995) confirmed the capitalist developmental state's significance in industrialization through emphasizing growth, productivity, and competitiveness and using an elite bureaucracy. Other research in Korea (e.g., Amsden 1992), Taiwan, and Singapore (e.g., Deyo 1987; Wade 1990; Wong 2004) amplified states' roles in industrial development.

Chinese state capitalism has commonalities with other Asian variants that have strong governments to direct investment and to suppress labor (Fligstein and Zhang 2011). Indeed, the Chinese government deliberately learned from Japanese, Korean, and Singaporean developmental experiences. In the late 1990s, Beijing tried to reorganize SOEs into big

business groups similar to those in Japan and Korea (White et al. 2008). The State-Owned Assets Supervision and Administration Commission (SASAC) of the State Council learned about asset management from Singapore's Ministry of Finance and Temasek. But in Japan, Korea, and Singapore, elite families have always controlled private, large firms (see Haley, Haley, and Tan 2009); in China, the state, rather than elite families, controls firms in the core Chinese economy.

Lin (2011) identified state capitalism as varying across two dimensions: the extent of the state's ownership of production; and the extent of the state's coordination with other enterprises. Among nation-states, China uniquely synchronizes party, government, military, and economy. The Chinese state freely creates and maintains enterprises, holds a majority of the shareholdings, controls critical personnel decisions, and supplies capital (Haley, Haley, and Tan 2004). SOEs compete with other enterprises in the market, and its elites enjoy capitalist rewards. However, the elites ultimately answer to the state rather than to boards of directors, shareholders, or other stakeholders. The market asymmetrically favors SOEs for capital and other resources. Some SOEs become national champions as the state restricts their competitors and encourages their mergers and acquisitions. Along with control of rewards and incentives for personnel and organizations, Lin (2011) identified control of capital as one of the distinguishing facets of Chinese state capitalism.

The Chinese central and provincial governments direct all the major financial institutions (Lin 2011). The State Council's vice premier manages all major banks. Seventeen institutions control four-fifths of the banking system's assets; the government appoints and controls their managers' mobility. Consequently, financial institutions fully cooperate with state's directives in disbursing capital. Despite provincial tussles, the Chinese state, financial institutions, and SOEs appear seamless in trade and foreign investment. For example, in trade agreements, the Chinese government almost always commits to infrastructural construction and natural-resource explorations, which it allocates as no-bid contracts to SOEs. The SOEs also receive financing from the Chinese state-owned banks. Table 1.2 indicates the extent of governmental ownership of bank assets in China.

Flows of capital serve as an important mechanism for Chinese state control of markets, but few industry studies exist of how these flows operate. Additionally, the opacity and complexity of Chinese government borrowing hinders accurate assessments of the state's liabilities and capital flows. In 2010, the Chinese central government had official treasury debt of less than 20 percent of GDP. However, using official government sources,

Table 1.2. GOVERNMENTS' SHARE OF BANK ASSETS IN CHINA, 2009

Full state control (63.4%)	Partial state control (22.1%)	Least state control (14.5%)
Large commercial banks (51.3%)	Joint-stock commercial banks (14.9%)	Rural credit cooperatives (10.9%)
Policy banks (8.7%)	City commercial banks (7.2%)	Nonbank financial institutions (1.9%)
Postal service banks (3.4%)		Foreign banks (1.7%)

Source: Compiled from Dean, Browne, and Oster 2010.

Batson and Zhang (2011) estimated public debt load as 82 percent of GDP in 2010. They attributed this debt to the myriad fiefdoms within China's large public sector that freely borrowed money to finance provincial, including industrial, ambitions (also see Shih 2008). As table 1.3 shows, local governments' debt rose from 0 percent of GDP in 1998 to 27 percent in 2010. Most of this lending originated from public-sector entities such as the China Development Bank, Ministry of Railways (MOR), and

Table 1.3. OFFICIAL CHINESE PUBLIC DEBT AS A PERCENTAGE OF GDP, 1998-2010

Year	Official domestic debt	Foreign debt	Central bank bills	Policy bank bonds	Ministry of Railways	Local govt. debts	Bank restructuring costs	Continuent NPL liabilities	Total
1998	9%	4%	0%	6%	2%	0%	3%	52%	76%
1999	12%	4%	0%	7%	2%	5%	7%	49%	86%
2000	13%	4%	0%	7%	2%	5%	15%	30%	76%
2001	14%	4%	0%	8%	2%	4%	15%	26%	73%
2002	16%	3%	1%	8%	2%	6%	14%	23%	74%
2003	17%	3%	2%	9%	1%	7%	12%	18%	70%
2004	16%	2%	7%	9%	1%	7%	13%	12%	67%
2005	17%	1%	12%	10%	1%	12%	17%	8%	77%
2006	16%	1%	15%	11%	2%	15%	14%	6%	80%
2007	19%	1%	14%	11%	2%	16%	11%	5%	80%
2008	17%	1%	15%	12%	2%	16%	12%	2%	77%
2009	18%	1%	12%	13%	3%	23%	11%	2%	84%
2010	17%	1%	10%	13%	4%	27%	9%	1%	82%

Source: Batson and Zhang 2011.

local-government investment corporations (LICs). Credit rating agency Fitch Ratings (2010) reported that Chinese banks were increasingly engaging in complex deals that hid the size and nature of their lending, obscuring hundreds of billions of dollars in loans. The report also said that Chinese regulators understated loan growth in the first half of 2010 by 28 percent, or about \$190 billion—real loans were closer to RMB 5.9 trillion than the reported RMB 4.6 trillion. Many banks continued secretly to shift loans off the books, creating a “pervasive understatement of credit growth and credit exposure.” In 2009, lending by state-run banks comprised one of China's most aggressive forms of stimulus (Barboza 2010).

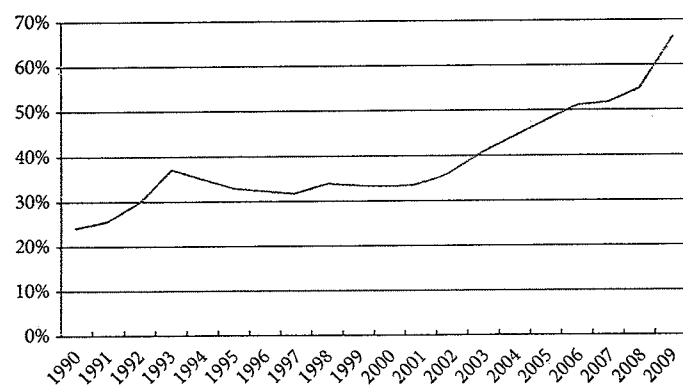
In 2011, China's first national audit of regional finances confirmed that local governments owed RMB 10,700 billion (\$1,650 billion) or about 27 percent of China's GDP, again easily outstripping the central government's official debt figures. The audit confirmed a rise of 62 percent in local governments' debt after the 2008 financial crisis. In 2011, other estimates put the government's contingent liabilities at over 150 percent of GDP when they included SOEs' debt implicitly backed by the state (Rabinovitch and Anderlini 2011). In contrast, the United States had a debt-to-GDP ratio of 93 percent, and Japan's ratio hovered at over 225 percent. The audit revealed that Chinese provincial governments had created over 6,576 arm's-length financing vehicles to circumvent central banking rules for easier access to RMB 4,971 billion in loans. But previous estimates had put the total debt load at closer to RMB 14,000 billion. The discrepancy arose because the audit only included loans to financing vehicles with explicit guarantees from local governments, rather than state land or other collateral that the governments mostly used instead.

Provincial governments' policies drive much of China's capital flows into fixed-asset investments, or investments in plant, equipment, infrastructure, and real estate. For example, in the fourth quarter of 2008, the Chinese central government allocated about two-thirds of its economic-stimulus package, or approximately RMB 2.7 trillion, for provincial governments' expenditures. However, the provincial governments' stimulus spending ballooned to nearly RMB 10 trillion, about four times the central government's contribution. The local governments borrowed cheaply or at no cost from state-owned banks to bridge the gap and invested this capital in industrial and infrastructural projects built by locally supported SOEs with materials purchased from other SOEs (Meyer 2011). China's fixed-asset investments jumped 33 percent in the first five months of 2009, the most in five years (Bloomberg, June 22, 2009). Table 1.4 shows the continued rise of fixed-asset investments in China from the 1990s. Figure 1.1 shows that fixed-asset investments grew from about 24 percent of GDP in

Table 1.4. FIXED-ASSET INVESTMENTS IN CHINA, 1990-2010

Period	Fixed-asset investment (RMBbn)	Fixed-asset investment nominal growth (%)	Fixed-asset investment real growth (%)
1990	451.7	2.4	-5.2
1991	559.5	23.9	13.2
1992	808.0	44.4	25.2
1993	1,307.2	61.8	27.8
1994	1,704.2	30.4	18.1
1995	2,001.9	17.5	11.0
1996	2,291.4	14.8	10.4
1997	2,494.1	8.8	7.0
1998	2,840.6	13.9	14.1
1999	2,985.5	5.1	5.5
2000	3,291.8	10.3	9.1
2001	3,721.4	13.0	12.5
2002	4,350.0	16.9	16.7
2003	5,556.7	27.7	25.0
2004	7,047.7	25.8	19.1
2005	8,860.4	25.7	23.7
2006	10,987.0	24.0	22.2
2007	13,732.4	24.8	20.1
2008	17,229.1	25.5	15.2
2009	22,484.6	30.1	33.3
2010E	27,656.0	21.0	16.9

Source: Dragonomics.

Figure 1.1
China's Fixed-Asset Investment as a Percentage of GDP, 1990-2009
Source: Dragonomics.

1990 to 66 percent of GDP in 2009. The next section provides economic rationales for subsidies.

ECONOMIC RATIONALES FOR SUBSIDIES

Economic rationales do not deal specifically with China but span the use of subsidies for industrial development (including effective corporate strategy), for technology development, and for the pursuit of strategic trade goals. A selective review of some theories as they explain the use of subsidies follows. Economists distinguish between general social expenditures (such as those on infrastructure) and specific subsidies to industries. General expenditures do not, in theory, affect resource allocations among industries or sectors. Conversely, economic theories mostly portray specific subsidies as distortive because they redistribute and reallocate resources according to nonmarket criteria, resulting in economically inefficient allocation of said resources. Except in special circumstances (such as with infant industries), economists have generally ignored the view that subsidies may contribute significantly to aspects of a country's comparative advantage, and not just disadvantage (Trebilcock et al. 1982).

According to classical free-trade theory, in domestic markets, subsidies can reduce either manufacturers' or consumers' costs for products. In either case, the country will produce or sell more of the subsidized products than in efficient markets without the distortive subsidies. Consequently, subsidies divert resources from efficient manufacturers (where the resources yield the highest returns through the market) to subsidized manufacturers (where they yield artificially high returns). The subsidizing country will become poorer by not using resources efficiently and through taxing its efficient producers (thereby increasing their net costs and reducing their market share of goods and investment) to pay for subsidizing inefficient manufacturers (Behboodi 1994).

Economists assume that in countries with representative governments, key interested parties decide on the costs and benefits of subsidies. Consequently, one can wrongly argue that if country A subsidizes production or exports, the resulting economic distortions become principally country A's misfortunes. Importing countries' consumers can enjoy the cheaper goods made possible by country A's subsidies (Hufbauer and Erb 1984) and expanded market share. Indeed, using panel data covering 325 manufacturing industries from 1997 to 2006, Auer and Fischer (2010) demonstrated that imports from nine low-wage countries (including China) resulted in strong downward pressure on prices. When

low-wage country A captures a 1 percent share of a US sector, producers' prices in that sector decrease by 2.35 percent (Auer and Fischer 2010). But despite apparent gains to consumers in importing countries, country A's subsidized producers may drive out other countries' producers, capture their markets, and later make good any losses through monopolistic pricing (Dixit 1983). Other countries may also emulate the subsidies, creating spirals of wasteful distortion and overinvestment. In this fashion, subsidies can reduce world economic efficiency and thereby the gains of international exchange to all countries. Economists therefore propose that unbridled and competing national subsidies can undermine world prosperity.

Economic theory provides guidance on using subsidies as one of many efficient means of attaining government-articulated objectives. Economists have analyzed the role of subsidies in building infrastructure, helping struggling or infant industries, promoting the development of new knowledge through research and development, redistributing income, helping poor consumers, and meeting a range of other social-policy objectives.

As WTO debates reveal, governments view some public-policy objectives, such as national security, cultural heritage, and diversity, as crucial to national identities and to transcending narrow economic-maximization objectives. Sectors in which national security considerations figure prominently include subsidies to food and energy production (World Trade Organization 2006). WTO discussions on subsidies as they relate to increasing agricultural production include concepts of "multifunctionality." For example, agricultural production results in commodities such as food and fiber and "noncommodities" that exhibit the characteristics of positive externalities and public goods. Noncommodities include landscape, cultural heritage, biodiversity, rural employment, food security, and animal welfare. WTO debates have centered on the least-costly policy alternatives, including subsidies, to attain multifunctional objectives.

Economic analysis can show how governmental subsidies help when the market allocation of resources appears inconsistent with social objectives. Analysis can also reveal whether subsidies provide the best policy among alternatives. However, when governmental decisions to grant subsidies have little to do with efficiency considerations, as in China, economic analysis based on welfare analysis offers few insights (see World Trade Organization 2006). Subsequent sections review how subsidies affect industrial development, knowledge acquisition, and strategic trade policy, as well as where economic theories fall short.

Industrial Development

Governments may justify subsidies as ways to overcome information barriers and coordination problems. In infant industries and undeveloped capital markets, subsidies may help producers, consumers, and lenders overcome informational barriers to market entry and enhance learning spillovers. Subsidies may aid coordination of interdependent investments corresponding to vertical linkages in production, large-scale economies, and restrictions to trade. Governments have used the prevalence of informational asymmetries in capital markets to justify credit subsidies. However, subsidies can only enhance efficiencies under specific assumptions regarding information asymmetries; under alternative assumptions, interventions become interest-rate taxes. Coordination failures also provide poor economic arguments because all relevant investments will necessarily result in profitable industries. Pure coordination may yield better results. Empirical research on industrial-development policy, including studies of the East Asian miracle from the World Bank, has left room for competing interpretations on the success of subsidies and the other factors that have contributed to successful industrial development.

Porter (1990) has argued that through consistent, long-term investments, governments can shape comparative industrial advantage to become more than a function of classical advantages (deriving from basic human, physical, and capital resources). By judicious and well-planned investments in infrastructure and key economic sectors, governments may enhance natural endowments and develop others. Government policies toward the capital market and education affect factor conditions. Governments can affect buyers' demands through regulation and shape producers' strategies through large-scale purchases. Thereby, governments can improve or detract from national advantage.

Porter's analysis has a distinct role for corporate strategy and rests on the premise that firms, not countries, compete in international markets. According to Porter, internationally successful firms locate each aspect of their activities in the country best suited to advance particular industrial interests. Even if a firm locates its entire production line in one country, it must take advantage of state-industry synergies for international success. Despite short-term benefits for firms, Porter (1990) argued that government subsidies detract from true competitive advantage. Subsidies delay industrial adjustment and innovations. Most subsidies also come with explicit or implicit strings, such as limits on where firms can locate plants or how many jobs they can eliminate, thereby constraining firms' flexibility. Ongoing subsidies dull incentives and create an attitude of

dependence. Firms' managers focus attention on renewing subsidies rather than creating true competitive advantage. Subsidized industries propagate their noncompetitiveness as subsidies to one ailing industry encourage others to seek them.

Porter identified tax incentives as better vehicles to upgrade industry than subsidies: tax incentives force firms to undertake projects only when they perceive economic returns. Direct subsidies may also provide more economic benefits when they cover modest fractions of firms' costs and governments use subsidies as signals of appropriate firms' behavior. He proposed that indirect government subsidies for education, infrastructure, and research universities sustain competitive national advantage and that consumer subsidies create fewer distortions than direct payments to firms.

Rather than through higher levels of output, countries may also achieve higher standards of living for their populations through low output in high-wage industries. Some economists have encouraged subsidies for higher-value-added production or for industries that pay higher wages (Katz and Summers 1989). Growth in these products will cause a shift of resources (including workers) from low-wage industries to higher-paying ones. Consequently, economists have argued that the subsidization of high-wage industries, such as the steel or aircraft industries, should result in shifts of resources and expansion of high-paying production that allow low-wage workers to move up and to collect industrial rents.⁵ This argument rests on the economic premise that in open economies, the greater the world price of the subsidized, high-wage, value-added product, the greater the marginal welfare gained per dollar of subsidy. Economists such as Porter have contended that industrialized countries cannot compete with Mexico, China, and India for low-wage products and should not aim to do so. A strategically sound industrial policy would then divert subsidies from low-wage industries to more advantageous ones.

Knowledge Acquisition

Some theories suggest that societies and consumers may gain from governmental subsidies to industries where large investments in R&D constitute barriers to entry. Governments may also use R&D subsidies to capture positive spillovers inherent in knowledge creation. The social benefits of new knowledge may exceed the benefits that private investors in R&D may be able to appropriate. R&D may therefore generate positive externalities,

and government subsidies may supplement resources devoted to creating knowledge (World Trade Organization 2006).

Rather than provide subsidies, governments can capture the spillover effects of R&D by granting firms temporary monopolies through intellectual-property regimes that encourage knowledge creation. A patent, for example, can guarantee the inventing firm the sole use of its invention over a specific period. This monopoly ensures higher returns on firms' investments in knowledge creation. Once the patent expires, other firms can benefit from the underlying knowledge. In the global economy, intellectual-property regimes need to protect patents across countries to maintain incentives for R&D investments. Lax intellectual-property regimes, such as China's (Haley, Haley, and Tan 2004), may modify or eradicate R&D externalities and the benefits of governmental subsidies. Consequently, the nature of worldwide intellectual property regimes should help shape policies on how firms may benefit from their research, positive externalities for other firms, and the country's optimum allocation of subsidies to private R&D.

Economists have acknowledged that governments may also subsidize firms to secure national advantage and to shift rents in industries characterized by economies of scale and imperfect competition, which may occur in R&D intensive industries: R&D intensity and other entry costs may lead to economies of scale in production processes. One can view subsidies for national champions, such as in China, as policies supporting such rent-shifting programs. Though these subsidies are likely to hurt trading partners' manufacturers in the same or similar industries, they may benefit consumers and importers of the manufactured products as increased competition lowers prices (World Trade Organization 2006). However, economists also highlight the risks of strategic subsidy schemes: the more governments enter into competition, the more likely that capital dissipates in excessive entry, eventually leading to higher than necessary consumer prices, as none of the subsidized firms can produce at efficient scale.

Some economists have argued that R&D subsidies may encourage firms to devote more resources to R&D activities and thereby increase the long-run rate of economic growth (Aghion and Howitt 1992; Romer 1990). Furthermore, because R&D subsidies may promote growth, many other public policies that indirectly affect R&D incentives for firms can also affect long-run growth. However, Segerstrom's (2000) analysis showed that the effects of general R&D subsidies on growth may vary by the static rates of vertical and horizontal innovation. Firms engage in vertical R&D to improve the quality of existing products, and in horizontal R&D to increase the number of industries in the economy (create entirely

new products). Segerstrom (2000) assumed that firms that innovate and become industry leaders earn temporary monopoly profits as rewards for their R&D efforts. Additionally, each innovation dimension (horizontal or vertical) has its own degree of static, diminishing returns to R&D expenditure. In the long run, a general R&D subsidy should increase innovation in the dimension in which diminishing returns set in more slowly. To summarize, general R&D subsidies should decrease long-run growth if they promote vertical innovation (horizontal R&D expenditures have greater diminishing returns), and horizontal innovation serves as the stronger engine of growth (R&D difficulty increases rapidly as product quality improves). General R&D subsidies should also decrease long-run growth if they promote horizontal innovation (vertical R&D expenditures have greater diminishing returns), and vertical innovation serves as the stronger engine of growth (R&D difficulty increases slowly as product quality improves). General R&D subsidies increase long-run growth in the opposite cases.

Strategic Trade Policy

The effects of subsidies on trade depend on the size of the subsidizing country and if its production becomes large enough to affect world prices. If production remains small, quantities in the market will change, but not prices. In large countries, both import-substituting and export-promoting subsidies will result in price declines. Many economists view subsidies for export promotion as preferable to those for import substitution because countries may choose those industries in which they have comparative advantages; and as many countries account for subsidies in national budgets, the costs of subsidies may be more transparent than those of tariffs, a generally preferable and more focused policy measure.

Brander and Spencer (1985) presented a theoretical analysis based on imperfect competition to demonstrate that export subsidies benefit subsidizing countries. Subsidies provide advantages to countries to capture large shares of the production of profit-earning, imperfectly competitive industries. Export subsidies thereby allow governments to carry out profit-shifting policies of industrial development. Brander and Spencer argued that in a world of imperfect information and imperfect governments, national motives for subsidies may open the door for various kinds of socially wasteful rent-seeking, jointly suboptimal for all producing nations. However, countries perceive themselves as competing for profitable international markets. In this global world, the credibility of

governmental support for industries, and specifically export subsidies, can confer strategic advantages on domestic firms. In particular subsidies can advantageously position domestic firms in noncooperative rivalries with other firms and allow them to expand their market shares. The terms of trade will move against the subsidizing country, but as price still exceeds the marginal resource cost of exports, the resulting expansion of exports can raise domestic welfare. Consequently, although producing countries have cooperative incentives to agree not to use export subsidies, they also have incentives to cheat on any resulting agreements, suggesting that international regulations that attempt to discourage subsidization, such as the General Agreement on Tariffs and Trade (GATT) or WTO, are likely to require regular reinforcement and scrutiny to survive.

Political Limits of Economic Rationales

Drawing primarily on studies of Western democracies, researchers have argued that governments rarely survey all appropriate policy instruments before relying on subsidies. Rather, subsidies emerge through political processes in which politicians and administrators act according to their own preferences and within constraints sets by lobbyists and labor groups (Spencer 1988). Political processes result in suboptimal economic systems in which individuals and groups further their own economic interests. Political actors appear as entrepreneurs selling subsidization policies for votes (Reynolds 1993), and firms appear as rent-seekers. Partisan political actions cause allocative inefficiencies and ethical problems, by encouraging firms to engage in rent-seeking or by reallocating tax revenues to small organized groups that aim to appropriate economic rents. Subsidies comprise wealth transfers from poorly organized social elements who cannot resist demands to well-organized groups pressing for them. Large enterprises, politically strategic regions, powerful industrial organizations, trade unions, or other highly concentrated interests benefit from subsidies, and small or newly established enterprises, consumers, or nonunionized wage-laborers pay for them. Firms' rent-seeking behaviors include lobbying, efforts to obtain valuable import licenses or quotas, donations to political parties, the promise of jobs and perquisites to policymakers, blackmail and bribery, and eventually increased corruption.

Subsidies comprise just one part of the complex socioeconomic structure of a country. The economic metaphors of free trade, comparative advantage, and efficient allocation of resources involve more than just deregulation of markets and removal of trade barriers. Without attention

to the national political contexts in which these decisions have occurred, these economic metaphors also appear insufficient to capture the vast changes that have ensued in global markets. Hudec (1990) observed that the market produces a better allocation of resources only if one assumes that resource allocation should proceed according to the desires of the consumers who make up market demand. However, in market economies, and especially in nonmarket economies such as China (U. C. V. Haley 2007), a multitude of actors make allocative and distributive decisions, ostensibly for economic, but probably also for political, moral, or social reasons. Which externalities they want to capture, the nature of their ideal markets, which social goods they want to protect or advance, and the types of industrial economies they want to foster comprise value choices that policymakers make through unique sociopolitical, and not necessarily economic or consumer-driven, channels. The next section views subsidies through the lens of state capitalism.

SOCIOPOLITICAL RATIONALES FOR CHINESE SUBSIDIES

Models in economics form metaphors and, far from value-free, reflect social assumptions (see Ziliak 2011). Using the dominant metaphor of market economics, Adam Smith's (1776) invisible hand (of self-regulating markets), many theorists have argued that free trade between rational, self-interested people and countries leads to greater wealth; others have concluded that collective attempts such as those by the Chinese government to steer economic outcomes through subsidies will naturally backfire because they benefit fewer individuals. Yet Chinese economic policies have historical precedents not in free-market but in Confucian metaphors, where individual utility subsumes in harmonious fashion to administrative utility (see Haley, Haley, and Tan 2004). Theories of market transition, multiorganizational states, and state-as shareholder shed light on the Chinese context for policy decisions on subsidies, with implications for Chinese and global welfare.

Market Transition Theory

Market Transition Theory owes its formal exposition to Victor Nee. Examining socialist economies that were opening up in the 1980s, especially China, Nee (1989) argued that shifts from planned to market economies change social stratification and erode the administrative elites'

relative powers. According to Nee (1989, 663), "The transition from redistributive to market coordination shifts sources of power and privilege to favor direct producers (i.e., entrepreneurs) relative to redistributors (i.e., cadres)." Nee identified three processes that transform socialist economies: market power, market incentives, and market opportunity. He assumed that markets favor human over political capital and direct production over redistribution. Using data from a 1985 survey in Fujian, Nee (1989, 1996) presented a clear theory on the role of markets and individual-level incentives in social transformations and, implicitly, on the trajectory of China's economic reforms: Markets would diminish the state's power, and individual freedom in market exchanges would fundamentally change China. He argued that the economic pursuits of power and plenty would drive economic reforms in China. As the Chinese government undertook reforms, Chinese and Western capitalist development would converge: markets would shape human capital, governmental position, and geographic development in both sets of societies. Nee also implied that individual-level economic indicators, such as household income, and returns to education could measure the degree of marketization in China (Guthrie 2000).

Market Transition Theory assumes that the Chinese state has aimed at creating a market economy based on private ownership, but political obstacles have blocked governmental reforms and implicitly have spawned production subsidies. The theorists have assumed that for short-term political expediency, Chinese policymakers settled for next-best alternatives to achieve a market economy, including semiprivatizing SOEs, subsidizing some industries, introducing foreign competition, and encouraging entrepreneurship. In these perspectives, subsidies serve as stopgap approaches to grease and to realign the wheels of burgeoning Chinese free-market capitalism. Yet facts belie these primarily Western assumptions: the power of the state is expanding in China. Figure 1.2 shows that since 1996, the ratio of private to government consumption has been falling rather than rising, as free-market theories would have us believe should happen in overtly successful economies. Trade has enabled the Chinese government to increase its share of both economic consumption and production. In May 2010, in the *Financial Times* annual ranking of the Global 500, a Chinese SOE, PetroChina, overtook Exxon Mobil as the world's most valuable company by market capitalization. Other Chinese companies in the top 15 included the state-run banks Industrial and Commercial Bank of China (ICBC) and China Construction Bank, and China Mobile (officially headquartered in Hong Kong).

Other data also belie Nee's predictions. For example, Huang (2008) convincingly argued against a gradualist trajectory of Chinese economic

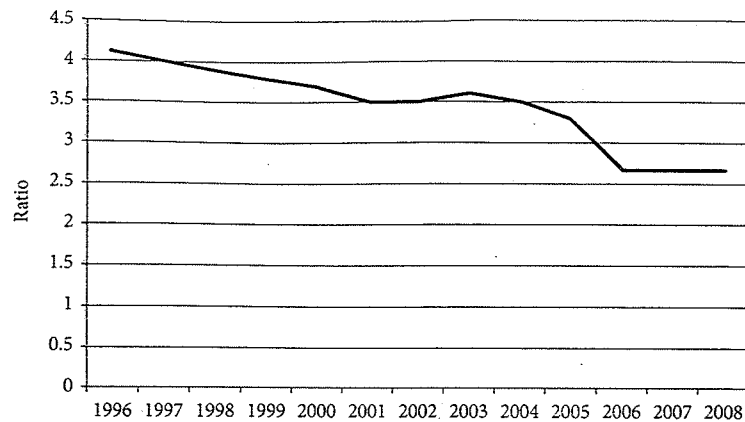


Figure 1.2
Ratio of Private to Government Consumption in China, 1996–2008
Source: Economist Intelligence Unit; OECD.

transformations that should have begun with small steps in the 1980s and then accelerated in the 1990s. Through analysis of Chinese government documents in town and village enterprises (TVEs), Huang (2008) showed that in the 1980s, bottom-up entrepreneurship and liberalization occurred on many fronts in China. However, in the 1990s, a substantial reversal of reforms took place. China's growth did not derive from conventional growth mechanisms, including private ownership, property rights, financial liberalization, and reforms of political institutions. In the 1990s, China reversed many highly productive rural experiments and policies and centralized rural administrative management. Chinese policymakers poured investment and credit into cities and heavily taxed rural sectors to finance state-led urban growth. In the 1990s, policy change drew on technocratic industrial policy with a heavy urban bias. Credit constraints on rural entrepreneurship, including private TVEs, rose substantially. Individual-level indicators corroborate the growth of administrative and urban elites. As Huang (2008) argued, in the 1990s, rural household income grew half as much as in the 1980s, and rural business income fell precipitously. Simultaneously, the size of government, measured as head counts of officials and the value of fixed assets they controlled, expanded enormously.

Huang (2008) listed several welfare implications from the policy reversals in the 1990s. Although GDP grew rapidly during both the 1980s and 1990s, household income grew much faster in the 1980s. The share of labor income to GDP rose in the 1980s but declined in the 1990s. Total

factor productivity growth since the late 1990s either slowed down from the 1980s or collapsed. The majority of China's poverty reduction occurred during the entrepreneurial era (1980–1988) rather than during the state-led era (1989–2002). In the 1990s, income disparities worsened substantially and have continued to worsen. Indeed, in 2011, income inequality in China ranked as the highest in the world, with the Gini index jumping from .28 in the mid-1980s to .4 twenty years later (*Economist* 2011).⁶ In the 1990s, land grabs and political corruption greatly increased. Additionally, despite vaunted increases in R&D, between 2000 and 2005 the number of illiterate Chinese adults increased by 30 million, reversing decades of progress in basic education (Huang 2008).

The Multiorganizational Chinese State

Rather than a unified political entity, the Chinese state consists of decentralized organizational sets that often pursue their own interests (Fligstein 1996; Shih 2008). Provinces in China have always enjoyed strong traditions of autonomy from the central government (Haley, Haley, and Tan 2004). In this context, Nee (1998) elaborated that formal (contracts, property rights, laws) and informal (norms, networks) constraints combine to shape organizational and economic environments in China. When the center's formal rules contradict powerful provincial preferences, a decoupling occurs of informal norms and practical activities from the formal rules. This decoupling “enables organizations to maintain standardized, legitimating, formal structures, while their activities vary in response to practical considerations ... [and] day-to-day business” (Nee 1998, 88).

Walder (1992) provided some of the institutional context for Chinese subsidies. He highlighted that to understand China's economic transformation, one had to understand also the hidden and conflicting budgetary processes that straddled central and local governments. Local governments and the firms they controlled had differing abilities to extract revenues from the center. The further from the central government a firm lay, the more power and control local governmental jurisdictions had over revenue extraction and firm management. Local officials ran their jurisdictions as they would industrial firms—local officials as industrial managers, governmental jurisdictions as industrial firms. As Walder (1992, 528–29) explained, “China's national budget is a nested hierarchy of independent budgets—each government unit exercises property rights over firms under their financial jurisdiction.... This bureaucratic economy, far from being a monolith, is composed of thousands of government

jurisdictions of varying sizes, each of which seeks to expand its revenues by capturing investment, subsidies, and grants."

As owners of enterprises, Chinese local and central governments also pursue objectives other than profitability (Kornai 1990; 1992); these objectives in turn influence choice of subsidies as policy instruments. Local and central governments' objectives include supplying scarce inputs for other enterprises, maintaining full employment, funding pensions, and providing medical insurance, housing, and social services. Government officials' nonfinancial objectives conflict with their interests in firms' strong financial performance. Governmental abilities to redistribute funds from profitable enterprises to subsidize those that are unprofitable also bolster their nonfinancial objectives (Walder 1995). Shirk (1993) observed that provincial governments often redistribute stronger firms' retained profits and governmental revenues to bolster weaker firms through "scientific research subsidies," or *keyen butie*; "reserve funds," or *jidong jijin*; and other subsidies—as well as use these funds for personal bonuses.

The governments' nonfinancial interests in firms, and the firms' dependence on governments for bailouts and subsidies, create mutual dependence. Walder (1995) referred to this situation as one of bilateral monopoly or extreme asset specificity. Suboptimal regimes of bargaining arise with soft budget constraints and incentives for firms to hoard and to overinvest. The governments' dependence upon firms for output, employment, and social welfare constrains their abilities to discipline firms or to shut them down. Firms' managers also conceal resources in their constant bargaining over more resources and more favorable financial terms. Simultaneously, governments faced with large numbers of firms to monitor encounter informational problems.

Walder (1995) concluded that in China, physical-output indicators did not provide information on the efficiency of firms, and financial indicators would prove inaccurate unless prices reflected market realities. Local bureaucracies have complicated monitoring by creating numerous competing principals that further impede or distort the flow of information back to the central government. Principals for SOEs include bureaus of taxation, finance, labor, and prices, as well as industrial bureaus. Each of these bureaus makes slightly different demands, many counter to the demand for strong financial performance, and contributes a layer or two of bureaucracy. Some bureaus, especially industrial bureaus, collude with firms to conceal slack resources and work at cross-purposes with other bureaus that monitor financial performance (Walder 1992). Under these relatively invariant Chinese institutional conditions, moves toward market

mechanisms and increased efficiencies will backfire without divesting the state of ownership (Kornai 1992).

Case studies confirm that provincial governments deploy massive subsidies to support favored business groups and further provincial rather than central objectives or efficiencies. For example, Xu and Yeh (2005) observed that in Guangzhou city, soft budget constraints allowed the municipal government to undertake investments without conforming to market logic or considering profits and costs. Liu (2008) observed similar patterns with the Shandong government. In July 1993, Shandong published "opinions on accelerating development of local business groups" and quickly selected 136 large groups for direct supervision. In 1996, Shandong identified eight groups as "provincial champions" and aimed to transform them into conglomerates similar to their chosen exemplar, South Korea's Samsung. For the provincial champions and other privileged businesses, the Shandong government constructed individual business plans, transferred old loans into state shares, upgraded enterprises with imported technology, supplied water, electricity, land, and transportation at discounted rates, and extended financial support as preferential tax rates, profit-retention schemes, and low-interest loans. For example, the Shandong government forgave merged enterprises' loan interest when those enterprises lost money within three continuous years and failed to pay loans for two years. With the "bank and enterprise hand in hand" policy, Shandong gave big groups priority access to bank loans and financial services. These subsidies created inefficient SOEs but also provincial champions, some of which became national leaders, like the Haier Group and the Qingdao Brewery Group.

The State as Paramount Shareholder

As indicated in the previous section, in state capitalism, the state, with its myriad interests, plays the leading role in national economic development. In China, state interests equate to those of the Communist Party of China (CPC) which has ruled China since 1949. The CPC forms the center of the Chinese state, military, and media, and the Chinese constitution guarantees its powers (McGregor 2010). The CPC's paramount interests have a big hand in shaping the policy environments around subsidies. In 2004, Hu Jintao succeeded Jiang Zemin as top leader of the fourth generation of leadership of the CPC, and therefore paramount leader of China. In 2003, he had assumed the lesser role of president. In China, political factors matter at least as much as, and often more than, economic factors

for firms' and markets' performance and therefore for the dispensation of subsidies (Haley, Haley, and Tan 2004).

From 2003 to 2012, Premier Wen Jiabao chaired China's State Council, the country's main administrative authority and the nerve center of China's state capitalism. The State Council includes the heads of all central ministries and important bureaucracies, including the National Development and Reform Commission (NDRC), which guides macroeconomic planning, intervenes in markets, sets prices for many products, and influences SOEs. In a CNN interview, Wen (2008) elaborated on the role of the Chinese state in markets: "The complete formulation of our economic policy is to give full play to the basic role of market forces in allocating resources under the macroeconomic guidance and regulation of the government. We have one important piece of experience of the past 30 years, that is to ensure that both the visible hand and invisible hand are given full play in regulating the market forces." Chinese policymakers have built an economic system to ensure that market forces serve primarily the CPC's development goals.

Bremmer (2010) has attributed the rise of Chinese state capitalism to the fall of the Soviet empire in 1991. He has argued that the CPC recognized that if it failed to generate prosperity for the Chinese people, it would similarly lose its control. To protect their monopoly on political power, the CPC's leaders endeavored to ensure that the state controlled as large a share as possible of the wealth that Chinese markets generate. Haley, Haley, and Tan (2004) have conversely argued that the Chinese never significantly changed their historical style of operation. Indeed, Chinese Communism approximated or emulated Soviet Communism far less than it did imperial administrative dynasties. A continuity of Chinese administration and management styles, including administrative and economic control, has existed from imperial through Maoist and modern times. This continuity emerged in the party manifesto issued after the fall of the Soviet empire, which stated, "The party must grasp not only the gun, but the asset economy as well." The managing of Chinese SOEs and business environments also reflects this continuity. Table 1.5 compares imperial and Maoist bureaucracies as they affected rent collection and center-province relations.

In the early 1990s, Chinese policymakers carefully studied Korean and Japanese development of large-scale indigenous firms that could compete in global markets; for Beijing, the lessons supported the subsidization of strategic industries. Policy discussions in Beijing referenced the nurturing role of the state in Korea and Japan (Thun 1994). As Vice Premier Wu Bangguo stated in 1998: "In reality, international economic confrontations

Table 1.5. COMPARING IMPERIAL AND MAOIST BUREAUCRACIES

Imperial bureaucracy	Maoist bureaucracy
Small policymaking core in capital	Small policymaking core in capital
Decentralized implementation by trained/ semitrained local elite—the scholarly/gentry class	Decentralized implementation by trained/ semitrained local elite—the local Communist cadres
Local bureaucracies beholden to the rulers, not to the ruled—imperial stated goals must be attained or surpassed	Local bureaucracies beholden to the rul- ers, not to the ruled—central govern- ment's stated goals must be attained or surpassed
Strong provincial governments following the center's lead—tended to go their own way when center was weak	Strong provincial governments following the center's lead—tended to go their own way when center was weak
Minimum standards of taxation contributed to center and set by center; local gentry set actual taxes collected from populace	Minimum standards of taxation collected for center and set by center; local cadres set actual taxes forwarded to center in names of cadres
Effect: Excessive taxes collected to amass per- sonal wealth for local elites and enhance social standing and power	Effect: Excessive rents collected at provin- cial levels to impress superiors with per- formance and enhance personal political position and power

Source: Compiled from Haley, Haley, and Tan 2004.

show that if a country has large companies or groups it will be assured of maintaining a certain market share and a position in the international economic order. America, for example, relies on General Motors, Boeing, Dupont and a batch of other multinational companies. Japan relies on six large enterprise groups and Korea relies on ten commercial groupings. In the same way now and in the next century our nation's position in the international economic order will be to a large extent determined by the position of our nation's large enterprises and groups" (cited in Nolan 2001, 17). Korean policymakers joined symposiums in Beijing to explain how the Korean government promoted the development of large firms (see Ministry of Machinery 1994, 11). Chinese policymakers concluded that by supporting targeted firms with low-interest loans and subsidies, preferential taxation, and exemptions from tariffs on imported equipment, they could advance the state's interests in the new economic order (Thun 2004).

Subsidies also helped when the Western financial crisis and global recession deprived China of many major customers, thereby threatening China's political stability (Bremmer 2010). In November 2008, Beijing used a \$586 billion stimulus package to subsidize the export

sector's survival, to prevent factory closings, and to minimize the risk of unemployed migrant workers generating civil unrest (European Chamber 2009; Komesaroff 2009). In 2009, China's central government used an additional \$19 billion to subsidize exports and factories. Despite diplomatic pressure from the United States (Krugman 2010), the Chinese government has also depressed the value of China's currency to spur exports and to increase foreign reserves that Beijing has used to make acquisitions around the world. Management consulting firm Accenture estimated that from January 2008 to June 2010, China's overseas acquisitions in America, Canada, Europe, and developing countries in Asia, Africa, and South America totaled over \$91.4 billion. Many of these acquisitions have attempted to secure long-term subsidized supplies of oil, gas, metals, minerals, and other commodities that China needs to continue economic expansion, to generate prosperity at home, and to safeguard the CPC's political future. Table 1.6 shows the rise of China's foreign-exchange reserves from \$11.1 billion in 1990 to \$2.8 trillion in 2010.

SOEs serve as the primary vehicles for Chinese state capitalism. According to China's Ministry of Finance, in 2008 SOEs' total assets approximated \$6 trillion, equal to 133 percent of annual economic output that year. Beijing sets non-profit-oriented goals for the SOEs to accomplish and thereby uses SOEs to further its industrial policies. Formed in 2003, SASAC manages the CPC's efforts to control China's SOEs while increasing the SOEs' economic returns and maintaining the government's political returns (G. T. Haley 2007). Through SASAC, the state's economic and political goals become operational. A total of 141 SOEs under SASAC made net profits of \$101.96 billion in 2008 with \$613 billion in revenues in the first five months of 2009 (*China Daily*, June 29, 2009). However, as George Haley (2007) testified before the US-China Economic and Security Review Commission (USCC), Chinese expectations of acceptable profitability do not necessarily correspond to Western expectations. Chinese policymakers view firms' bottom lines differently than do Westerners: technology acquisition provides a key goal in Chinese firms' operations, even at the expense of surrendering profitability.⁷ Chinese policymakers also view successful use of SOEs as instruments to obtain foreign-policy goals as part of the SOEs' profits. Historically, any Chinese SOE, especially a major one, could rely on substantial government subsidies and bailouts whenever it encountered losses.

To handle information streams emanating from the state's multiple bureaucracies, the Fifteenth CPC Congress formulated the "grasping the large, and letting the small go" policy (G. T. Haley 2007). Premier Zhu

Table 1.6. GROWTH OF CHINA'S
FOREIGN-EXCHANGE RESERVES, 1990-2010

Period	Foreign exchange reserves (US\$bn)	Additions to foreign exchange reserves (US\$bn) ^a	Growth
1990	11.1	n.a.	
1991	21.7	10.6	95.5%
1992	19.4	-2.3	-10.6%
1993	21.2	1.8	9.3%
1994	51.6	30.4	143.4%
1995	73.6	22.0	42.6%
1996	105.0	31.4	42.7%
1997	139.9	34.9	33.2%
1998	145.0	5.1	3.6%
1999	154.7	9.7	6.7%
2000	165.6	10.9	7.0%
2001	212.2	46.6	28.1%
2002	286.4	74.2	35.0%
2003	403.3	161.9 ^a	40.8%
2004	609.9	206.7	51.2%
2005	818.9	208.9	34.3%
2006	1066.3	247.5	30.2%
2007	1528.2	461.9	43.3%
2008	1946.0	417.8	27.3%
2009	2399.2	453.2	23.3%
2010	2847.3	448.1	18.7%

Source: Dragonomics.

^a Additions to foreign-exchange reserves are adjusted to account for \$45 billion transferred to Bank of China and China Construction Bank on December 31, 2003.

Rongji had proposed the slogan as pragmatic recognition that in the more complex world that China had entered, the state could not control "the small" details and should focus on controlling the most important details, that is, "the large." SOEs serve as the primary agencies for state control of industrial development in China. During the financial crisis beginning in 2008, massive governmental stimulus spending strongly favored SOEs through a government policy known as *guo jin min tui*, or "the state advances, the private sector retreats." In the first half of 2009, small and medium-sized enterprises (SMEs) received only 8.5 percent of the \$1.1 trillion of Chinese government loans; yet SMEs created and supported

70 percent of urban jobs in China (*China Daily*, January 20, 2009). In 2010, many SOEs with subsidized balance sheets were buying smaller private-sector competitors and extending the reach of the state.

In the hierarchy of SOEs, pillar or key industries serve as China's national champions, with access to priority funding, including subsidies. China chooses pillar industries on the following criteria (G. T. Haley, 2009): (1) defense, (2) job creation, (3) technology acquisition, and (4) competitive advantage. Several industries fall under more than one criterion. Fifteen industries constitute pillar industries for China, as promulgated in China's Tenth and Eleventh Five-Year Plans: (1) aerospace, (2) autos and auto parts, (3) banking and insurance, (4) biotechnology, (5) computer chip design and manufacture, (6) computing and computer hardware, (7) information technology, (8) iron and steel, (9) logistics, shipping, and storage, (10) machinery and mechanical equipment, (11) oil and petrochemicals, (12) software, (13) telecommunications and telecom equipment, (14) utilities and power equipment, and (15) wholesaling and retailing. Individual provinces also have their own SASACs and may anoint their own pillar industries for provincial development from the central list; as indicated in the previous section, the provinces often support their local champions from extrabudgetary sources of revenue that they do not share or divulge to the central government. Consequently, many firms in pillar industries receive subsidies from both central and provincial sources.

In October 2010, the CPC Central Committee's Proposal for Formulating the Twelfth Five-Year Program for China's Economic and Social Development (2011–2015), stated that over the next five years, Beijing planned to nurture an additional seven new strategic industries and to develop these into pillar industries. The industries included (1) new-generation information technology, (2) energy-saving and environment protection, (3) new energy, (4) biology, (5) high-end equipment manufacturing, (6) new materials, and (7) new-energy cars. The proposal indicated that to develop these industries, Beijing would increase available R&D funds; implement fiscal, tax, and financial policies to support major state-level science and technology projects; promote indigenous innovation to improve industry core competitiveness and economic efficiency; and "adjust" tax and pricing systems for land, water, and electricity so that their share of GDP would rise from less than 2 percent in 2011 to 8 percent in 2015.

Cheap loans from state-controlled banks and other subsidies have contributed not just to the extraordinary rise in fixed-asset investments outlined in table 1.4, but also to enormous excess capacity in China. From 2003 to 2008, the overall ratio of China's gross industrial output almost doubled to 160 percent of GDP, while the relative size of heavy industrial

production in the economy nearly tripled (Komesaroff 2009). As has become apparent in solar-panel production, China exported its excess production, depressing international prices and driving down global industrial efficiencies (Haley and Haley 2012). National Bureau of Statistics data show that in 2009, China's steel industry, already the world's largest, had the capacity to produce 660 million tons per year, with excess capacity of 22 percent; yet another 70 million tons of capacity was under construction. True excess capacity in this industry appears even higher, as recent central government audits have identified many small, unapproved mills with a combined capacity of 30 million tons. Thus by the end of 2010, China likely had steel capacity of around 760 million tons—far in excess of annual steel demand, which is now running at about 574 million tons. China's surplus capacity of almost 200 million tons looms larger than total output from Japan, the world's second-largest producer (Komesaroff 2009). Similarly, China is the world's largest producer of polysilicon for solar panels, but has excess capacity of over 80 percent in this industry. As the industrial case studies in this book highlight, overcapacity extends across the board in China. Besides steel, polysilicon, and solar panels, China is also the world's largest producer of aluminum, autos, cement, plate glass, coal, chemicals, wind power equipment, ships, crushed soybeans, and fertilizer; according to the State Council, all these industries also suffer from great overcapacity (Komesaroff 2009).

Researchers have isolated underpriced distorted factor inputs, predominantly cheap capital that subsidizes production and investment, as a primary cause for China's extraordinary growth and excess capacity (Huang and Wang 2010). Excess capacity in Chinese heavy industry has contributed to global economic imbalances. Heavy industrial exports accounted for 39 percent of China's total exports in 2008, up from 29 percent in 2002. As a European Chamber (2009) report described, China's growth model requires that external demand from the European Union (EU) and the United States continue to absorb the overcapacity it produces. Despite the impact of the financial crisis on these major global consumers, investments in excess capacity continue unabated in China.

Theories of subsidies drawing on international trade and international law fail to explain fully the modern economic rise of China. Developed in times when state capitalism did not constitute a major player in the global economy, they provide skeletal, sometimes misleading guidance on corporate or governmental policies. During the thirteenth century, professors at the University of Paris decided to investigate if oil would congeal if left out overnight. For them, research meant searching through Aristotle's writings. However, as Aristotle had never addressed the issue,

they declared the question unanswerable (Starbuck 2006). Rather than declaring China's hidden advantage as unanswerable and somewhat magical, we propose viewing the issue through the prism of state capitalism and subsidies. In chapter 2, we review some empirical evidence on the effects of subsidies and delineate the methodology in our industry studies.

NOTES

1. In August 2011, Evergreen Solar filed for bankruptcy in the United States, stating that it could not compete with Chinese competitors without reorganization.
2. According to Mercom, the top five loan subsidies from China Development Bank to Chinese solar companies included those to LDK Solar (credit \$8.9 billion), Suntech (loan \$7.3 billion), Yingli Green Energy Holdings (loan \$8.3 billion), JA Solar Holdings (loan \$4.4 billion), and Trina Solar (loan \$4.4 billion).
3. In economics, comparative advantage results from differing endowments of the factors of production (capital, land, labor) entrepreneurial skills, power, technology, etc. The concept owes its origins to David Ricardo (1772–1823) and his work on comparative costs. For trade, comparative advantage implies that a country should specialize in producing and exporting only those goods and services that it can produce more efficiently (at lower opportunity costs) than other goods and services (which it should import). Ergo, free trade benefits all countries, because each can gain (the gains from trade) if it specializes according to its comparative advantage.
4. For example, according to statistics from Nomura International, the minimum monthly wage in Beijing rose from about RMB 200 in 1994 to RMB 1,200 in 2011.
5. Economic rent refers to excess distribution to any factor in a production process above the amount required to draw the factor into the process or to sustain the current use of the factor.
6. The Gini index is the most common measure of inequality. A score of 0 means perfect equality and everyone earns the same. A score of 1 means that one person gets everything. The United States has the second-most unequal society, with a Gini index that rose from 0.34 in the 1980s to 0.38 in the mid-2000s.
7. Huang (2003) also emphasized that SOEs' primary objectives include qualifying for state allocation of foreign exchange to finance technology acquisition.

CHAPTER 2

Measuring Subsidies to Chinese Industry

This book draws on four sequential industry studies conducted between 2007 and 2011 to identify the growth of subsidies to Chinese manufacturing over time: steel (covering the period 2000 to 2007), glass (2004 to 2008), paper (2002 to 2009) and auto parts (2001 to 2011). In all these industries, China has moved from a net importer to one of the largest, if not the largest, exporters in the world. In all these capital-intensive industries, labor comprised a small part, between 2 and 7 percent, of total costs. In these fragmented industries, the vast majority of firms enjoyed no economies of scale or scope. Although the time periods and some of the industry-specific variables vary because of the availability of data, all studies build on common assumptions and use some common variables. This chapter defines subsidies, highlights previous empirical research that identified subsidies in China, indicates problems with measurement and data, and covers the rationales for the variables and methodologies we used.

SUBSIDIES AND CHINESE POLICY

In 1947, the GATT's original drafters paid little heed to the trade issues associated with subsidies; in 1995, the GATT was subsumed by the WTO, which has reflected the perceived need to discipline subsidies in an increasingly integrated world. For instance, the GATT, including the Tokyo Round Subsidies Code resulting from negotiations in 1979, contained no definition of the term "subsidy." However, the WTO's Agreement on Subsidies and Countervailing Measures (SCM) formally identified subsidies for the first

CHAPTER 7

Subsidies, Business Strategy, and Trade Policy

Since Adam Smith and David Ricardo, theories of commercial policies have debated the advantages of free trade versus protectionist policies that restrict imports and promote exports. Following Rodrik's (1995) analysis of trade outcomes, we classify forces of supply and demand as shaping subsidies. The demand side incorporates business strategy and includes individuals' and interest groups' preferences. The supply side incorporates trade policy and includes policymakers' preferences and governments' institutional structures. This chapter first analyzes how subsidies to industry, specifically to Chinese industry, have affected and are affected by business strategy and trade policy. The Chinese subsidy practices we cover in this book have impact beyond the boundaries of the steel, glass, paper, auto parts, and solar industries on which we have focused. We next explore the implications of Chinese manufacturing subsidies for firms, for the global economy, and for future research.

BUSINESS STRATEGY

Some empirical research shows that Chinese manufacturing subsidies positively affect firms' exports and performance and therefore elicit strategic behaviors from firms. Girma and colleagues (2007, 2009) documented evidence that the effects of production subsidies vary by firms' characteristics. Using an unbalanced panel data set of more than 140,000 firms from 1999 to 2005, they found that Chinese production subsidies affected domestic exporters' performance and their volume of exports, not just through covering losses but through compensating for

some strategic costs. They found that subsidies affected Chinese exporters' performance most strongly when they operated in capital-intensive industries located in noncoastal regions and were already profitable. They based their conclusions on economic theoretical modeling that departs from assuming fixed costs of exporting and allows instead for variable market-penetration costs. They argued that Chinese production subsidies help existing exporters afford the higher, market-penetration costs they incur when expanding sales in export markets.

Business strategies include not just lobbying for subsidies but advocating for protection from subsidized foreign competitors. A large theoretical and empirical literature exists on which domestic groups in industrialized countries seek protection (e.g., Krueger 1974; Laverne 1983; Ray 1981). Most theories on the political economy of trade have focused on the elicited demand for protection rather than on the range of corporate trade responses. Many of the theorists have argued that a given set of uncompetitive industries prefers protectionist policies at home to other trade solutions. Some researchers have portrayed business efforts to lobby for protection as rent seeking.¹ For example, Lenway, Morck, and Yeung (1996) characterized the steel industry's lobbying strategies as political rent-seeking to secure future returns in trade protection. They presented empirical evidence from 1977 to 1988 to argue that trade protection returns private benefits to shareholders, senior workers, and lobby firms' CEOs, rewards less-innovative firms, and frustrates the Schumpeterian development of an industry. However, Lenway, Morck, and Yeung assumed free markets and perfect competition in the absence of government regulation to protect domestic markets—not situations where massive subsidies may distort markets prior to government regulation, as currently exists with Chinese trade.

Indeed, free trade may lead to suboptimal outcomes, and protectionism can increase national income by raising firms' profitability in imperfect markets (Krugman 1986). As Yoffie and Milner (1989) argued, greater scale economies and cumulative-experience effects make strategic groups² more dependent on access to foreign markets. If the Chinese government blocks access to its markets through protection, or subsidizes Chinese firms to compete effectively with US firms, US firms' preferred policies depend upon foreign rivals' choices. This interdependence leads to strategic trade policy where the firms place contingent demands that free trade at home depend on reciprocal access to foreign markets.

Since China joined the WTO in 2001, the opening of its markets for investment and trade has remained a major issue for foreign firms. In December 2006, the SASAC and China's State Council jointly announced

the "Guiding Opinion on Promoting the Adjustment of State-Owned Capital and the Reorganization of State-Owned Enterprises." The policy statement identified seven strategic industries in which the state must maintain "absolute control through dominant state-owned enterprises," including armaments, power generation and distribution, oil and petrochemicals, telecommunications, coal, civil aviation, and shipping; foreign firms cannot participate in these industries or markets. The policy statement also identified five "heavyweight" industries in which the state will remain heavily involved, including machinery, automobiles, information technology, construction, and iron, steel, and nonferrous metals; foreign firms have restricted participation in these industries and experience heavy regulation (US-China Economic and Security Review Commission 2011).

Milner and Yoffie (1989) concluded that *ceteris paribus*, if a foreign government failed to create a competitive edge for its firms through subsidies and allowed foreign firms free entry into its markets, multinational corporations would avoid the potential costs associated with strategic trade policy, including retaliation and blocked access to foreign markets. But, if as has happened with China, foreign governments increase their firms' market shares in the United States, block access to domestic markets, and reduce US firms' profits through subsidizing their own firms, then rational multinational corporations would support protectionism at home.

Yoffie and Milner (1989) argued that strategic trade policy can potentially exploit three key market imperfections in traded sectors: large economies of scale with minimum efficient scales, steep learning curves that bestow first-mover advantages, and sizable R&D requirements that erect barriers to entry. When these market imperfections exist, domestic firms' access to foreign markets and foreign firms' and foreign governments' behaviors can directly affect domestic profits. Foreign subsidies or protectionism could give foreign competitors cost advantages that later entrants could not match. With an open US market and closed China market, Chinese firms could achieve more efficient scale via sales volume domestically and abroad while squeezing US competitors into a portion of their domestic market. Once firms fall behind in these industries, recovering profitability would become unlikely, and so strategic trade policy should rationally become their managers' top priority. As detailed later, these circumstances have emerged for US solar PV manufacturers (also see Haley and Haley 2012a, 2012b).

Yoffie and Milner (1989) also argued that the speed and intensity with which firms act become critical. Extending their arguments, a strategic

group such as US solar PV manufacturers would only benefit from strategic trade policy before Chinese firms gain long-term sustainable advantages. Once the foreign firms achieve long-term sustainable advantages, the researchers concluded, foreign-market access would no longer benefit domestic firms, as they could not compete there. Under those conditions, domestic firms' choices would include only exit or unconditional protection. The level of industry segmentation into strategic groups affects speed and intensity. In the solar industry, at least two strategic groups have emerged with different competitive strategies: the Coalition of Solar Manufacturers (CASM), consisting of US manufacturers, has argued for strategic trade policy including countervailing and antidumping duties against illegally subsidized Chinese imports; the Coalition for Affordable Solar Energy (CASE), consisting of installers, Chinese manufacturers, and US importers, has argued for free trade and the ability to buy cheap, subsidized, imported Chinese solar panels. These distinctive strategic groups have hindered the development of a common industry response. In these fragmented industries with slow industry response, if foreign governments' intervention leads to rapid deterioration in domestic firms' net income and market shares, then the domestic industries will lose their first-mover advantages and become increasingly uncompetitive. If industrial competitiveness declines rapidly, only unconditional protection at home will allow these firms to survive.

Haley and Schuler (2011) proposed that in the solar PV industry, business strategies alter in response to production or consumption subsidies and include market or competitive (Porter 1985) as well as nonmarket or political (Baron 1995) strategies. Table 7.1 provides a static framework for profitable firms' market and nonmarket strategies in the solar PV industry. Haley and Schuler (2011) examined separately firms' strategic responses at the solar PV supply chain's three segments, upstream, midstream, and downstream, with distinct strategic groups that face diverse competitive environments, as elaborated in table 7.2. They also considered the initial policy environment "fixed" and focused on nonmarket actions that firms in particular localities (e.g., in California) could take toward the domestic federal and state governments of those same localities. They ignored the political actions that domestic firms might take toward foreign governments. Haley and Schuler (2011) proposed the following four quadrants of generic business strategies for solar firms, and these could apply to other industries as well.

Quadrant 1: No consumption or production subsidies. The first quadrant represents a policy environment that does not generally exist for this industry: solar power's high cost relative to other energy precludes the industry's

With lower barriers to entry than in upstream production, market competition derives from differentiation through technology, operational efficiency, delivery, and pricing. Nonmarket strategies toward enforcing intellectual property (IP) and maintaining open markets assume importance. But if domestic demand wanes and prices and profits fall, domestic firms may use nonmarket strategies to seek assistance such as trade protection against foreign rivals.

Over 5,000 firms also operate in the highly competitive and fragmented downstream segment. Firms compete on price as well as the delivery of systems (solar components, plus interconnections to grids, etc., as well as oftentimes financing). Nonmarket strategies may provide shelter from pure competition. Nonmarket strategies open avenues to diverse customers such as government agencies (e.g., municipal power companies), highly regulated entities (e.g., public utilities), or those subject to regulation (e.g., residential users currently purchasing electricity from regulated utilities). Nonmarket strategies may also help circumvent public opposition to restrictions such as roof-top installations in residential areas, another source of regulatory uncertainty.

Quadrant II: Consumption subsidies, but no production subsidies. While most countries extend both production and consumption subsidies, emphasis and institutional support for policies vary. Some countries, notably Germany and Spain, and a few US states have taken the lead in raising product awareness and providing incentives to consumers to purchase solar PV systems.

Upstream and midstream firms benefit from consumption policies, depending upon domestic markets' size. In large domestic markets, consumption subsidies create larger domestic drivers to pull products through the markets. Domestic producers of solar components with policy-created domestic demand, such as in California, Texas, and New Jersey, may also use nonmarket strategies to buffer against foreign competitors' encroachment. For example, Canadian midstream producers used nonmarket strategies to obtain a domestic-content requirement of 50 percent by 2010 and 60 percent by 2011 to Ontario's Feed-in-Tariff scheme for large solar projects.

Downstream firms become highly dependent on consumption subsidies to drive their business. These policies promote awareness of solar-energy products and more importantly reduce costs and increase availability to consumers, directly affecting marketplace participation. Downstream firms relying upon consumption policies use nonmarket strategies to address such dependence. In addition to lobbying public officials to maintain or to increase consumption assistance, downstream firms work

cooperatively with nontraditional partners such as environmental groups and builders toward expanding such policies. Examples of such cooperation include Net-Zero affordable homes that come with solar panels as standard features in Arizona, California, Colorado, and Nevada. Domestic installers may favor policies that prohibit foreign installers from bidding on certain projects. Profitable domestic installers create networks of reliable suppliers from domestic and foreign locations. Consequently, firms in this segment support trade liberalization, as the modules they install often come from foreign countries.

As has occurred in Spain and some US states, we propose that a preponderance of consumption over systematic production policies results in a proclivity to import. From 2000 to 2010, the trade imbalance between the United States and China on solar cells made into modules steadily grew from \$12 million to an estimated \$1.12 billion, reflecting rising US imports from China, which grew from \$13 million to an estimated \$1.14 billion during that same period (Scott 2010).

Quadrant III: No consumption assistance, but production assistance. Governments attempt to spur the solar industry's development by offering subsidies to producers, including access to low-cost financing, direct grants, tax abatement, and other tax credits. As noted previously, China offers enormous and consistent production subsidies for solar PV producers, especially in the form of low-cost loans with easy terms for upstream and midstream firms, though assistance for consumption has lagged.³

Production assistance enables solar PV's upstream producers to achieve economies of scale and to erect barriers to entry. Polysilicon firms especially need plentiful and inexpensive capital to scale up production. Since governments mainly provide the cheap capital, firms deploy nonmarket strategies to mitigate financial risk. For example, since its inception, GCL Poly has employed nonmarket strategies to receive protection from top Communist Party leaders in its home province, Jiangsu, according to Chinese court and local media reports.⁴ Midstream wafer, cell, and module producers also benefit from production subsidies. In highly competitive markets, domestic producers may pursue nonmarket strategies to direct production support toward themselves and away from foreign-owned or controlled firms. For instance, in 2010, China's Ministry of Finance chose Chinese firm Yingli to supply 70 percent of the modules for the Golden Sun project's first phase over foreign firms' higher bids. With its excellent government contacts, Yingli received \$114 million in prepayments, or 35 percent of the total purchase price, in advance as an instant rebate. To meet capital shortfalls in the future, Yingli also cultivated political relationships to obtain additional low-cost loans from other state-owned banks, including the Export

and Import Bank of China, ICBC, Bank of China, China Construction Bank, Bank of Communications, Citic, and Minsheng Bank.⁵

Furthermore, since midstream products trade in international markets, firms may pursue nonmarket strategies toward maintaining open markets for their products. Since many midstream firms attempt to differentiate through product innovation, they also may favor production-assistance policies that subsidize R&D as well as protect IP.

In the supply chain, downstream firms have the least direct interest in production subsidies. Their business strategies relate more to purchasing components and configuring them into systems. Downstream firms benefit indirectly from production subsidies that stimulate module production, increase quantities and choices in the market, and place downward pressure on prices. However, we would not expect that downstream producers invest heavily in nonmarket strategies to obtain production subsidies.

As has occurred in China, we propose that a preponderance of production over systematic consumption policies results in a proclivity to export. Excess capacities in their domestic markets, driven by production policies, encourage Chinese firms' exports.

Quadrant IV: Consumption and production assistance. We have shown that most countries utilize both consumption and production-subsidy policies. The relative emphasis and effectiveness of such policies vary across countries and across time and have global repercussions. Extensive and uncoordinated public policies across countries oftentimes lead to profound supply-demand imbalances, as shown with the excess supply in the solar industry. With production assistance, upstream producers position themselves to achieve economies of scale, as well as to move toward higher-grade polysilicon for higher-quality silicon wafers. Successful firms seek plentiful customers for their output as well as low-cost capital for investments in plants and production equipment. We expect these firms, which are highly dependent on government policies, to push aggressively for production assistance, including long-term and low-interest capital. Firms will also favor policies that expand product demand, subsidize users, and liberalize trade regimes to enable pursuit of foreign customers. Firms may also vertically integrate to have captive downstream markets to mitigate regulatory risk in case production assistance falls.

Midstream firms in this environment employ niche-market strategies of quality, differentiation, technology, service, and rapid distribution to compete for increased demand. For instance, cost and technology leader First Solar from the United States has expanded capacity and offered value-added services such as rapid construction and customized design for access to high-profile projects around the world. First Solar has also

effectively used nonmarket strategies to sell projects and overcome non-tariff barriers in emerging and developed markets. Midstream firms may pursue advantages through technological innovations and thus support governmental programs of R&D assistance and strong IP regimes to safeguard inventions. These firms will also favor public, preferably low-cost, financing, although domestic firms may pursue nonmarket strategies to limit recipients to domestically located or domestically owned and controlled firms. Midstream firms seek governmental schemes that spur demand for solar products, such as California's expanded mandates for solar use put into law in 2011. Midstream firms also pursue policies that open international markets to their products.

We expect that successful downstream firms will pursue public policies toward either mandating solar use or lowering its price to end users. For example, in Austin, Texas, the city-owned utility has a mandate to obtain 100 MW of electricity from solar power by 2020. We also expect that firms in this segment will support public policies that give tax incentives and production subsidies for solar projects and may partner with other organizations, such as environmental groups, that seek greater solar usage. Foreign firms will follow consumption subsidies that support higher internal rates of return, such as Chinese Suntech's expansion into Goodyear, Arizona. As foreign competitors move into domestic installation markets, domestic firms may use nonmarket strategies to limit the consumption-assistance programs to domestic installers.

TRADE POLICY

Most contributors to the economic analysis of strategic trade policy have viewed government attempts to apply policy as a Pandora's box (Brander 1995) partly because of very high informational requirements. These theorists also see lobbying and other forms of transfer seeking described in the previous section as resulting in major distortions. However as Brander (1995) indicated, interventionist policies in Japan, Korea, and France probably aided industries and companies from these countries in developing a strong international presence. Consequently, an understanding of strategic trade-policy instruments can explain some patterns of specialization ensuing from trade with China. As Eckhaus (2006) concluded in his empirical study, an overall positive relationship exists between Chinese industrial subsidies and Chinese exports. This relationship holds especially for SOEs and particularly for the coastal provinces, whose exports accounted for 92 percent of all Chinese exports in 1999.

Mattoo and Subramanian (2011) noted that from 2001 to 2009, China has loomed especially large in the most-protected sectors of major trading partners' markets. In 2009 in these most-protected sectors, share of imports from China greatly exceeded overall imports and dwarfed that of any other country. For example, China's share of the most-protected sectors in Japan was over 70 percent, in Korea over 60 percent, in Brazil about 55 percent, and in the United States, Canada, and the EU about 50 percent each. Even in these protected sectors, China's share increased dramatically over the course of the Doha Round of trade-liberalizing negotiations among WTO members. In many of the importing countries (e.g., Brazil, the EU, and the United States), China's share more than doubled. Indeed, China gained market share even in countries such as Canada, Mexico, and Turkey that have free-trade agreements with close and large neighbors. Thus, liberalization under the Doha agenda, especially in the politically charged, high-tariff sectors, resulted in other countries opening their markets to Chinese exports. For example, in the United States, China had by far the highest share of imports in 8 out of the 10 most-protected sectors, ranging from 22 percent in man-made fibers to 76 percent in footwear. But the Chinese market, despite China's far-reaching WTO-accession commitments, remained protected across several products (such as fertilizers, vehicles, and many manufacturing items) while the Chinese government simultaneously subsidized its manufacturers for increased exports. Consequently, industrial countries have increasingly resorted to contingent protection against imports from China. In March 2012, China's deputy minister of commerce, Zhong Shan, said at a conference that in each of the last 17 consecutive years, China has had more trade conflicts than any other country in the world, in more industries and with more countries. Since the beginning of 2012, eight trade complaints had been filed against China and over 100 had been filed in the previous 12 months. Since 2008, 600 trade complaints had been filed against China (*Beijing News* 2012). Table 7.3 lists the major trade disputes between the United States and China from full accession to the WTO in 2002 through 2011.

Developing-country's trade actions against China exceeded those of industrialized countries. For example, the share of developing-country antidumping actions against China (as a share of their total actions) increased from 19 percent in 2002 to 34 percent in 2009 (Mattoo and Subramanian 2011). The corresponding figures for industrialized countries approximated 11 and 27 percent, respectively. However, recourse to trade actions will become more difficult when China attains market-economy status in 2016. Additionally, the product-specific transitional safeguards that existing members negotiated at the time of China's WTO accession are

Table 7.3. REPRESENTATIVE US-CHINA TRADE DISPUTES, 2002-2011

Date	Complainant	Issue
March 2002	China	China joins other countries in a complaint about safeguard measures imposed by the US that increases duties on steel imports.
March 2004	US	The US complains Chinese semiconductor producers pay less tax than their foreign competitors.
March 2006	US	The US and other countries complain that China has imposed measures including tariffs that adversely affect their auto-parts exports.
February 2007	US	The US complains that China has granted tax refunds, reductions, and exemptions for companies that buy domestic goods.
February 2007	US	The US files a request for consultations regarding Chinese subsidies paid to foreign invested enterprises.
April 2007	US	The US lodges two cases with the WTO on intellectual property rights protection and market access for US movies, DVDs, books, and music.
April 2007	China	China complains against US duties on glossy paper used in packaging.
July 2007	US	A US study says China's steel industry has benefited over the past 10 years from the "pervasive influence" of financial transfers from central and local government bodies, some of which are alleged to have broken WTO rules.
March 2008	US	The US complains about China's attempt to put the financial information business of international news providers under the control of local rival and regulator, Xinhua News Agency.
September 2008	China	China files request for consultations regarding US policy to treat China as a nonmarket economy when imposing antidumping and countervailing duty safeguards.
December 2008	US	The US files request for consultations regarding subsidies promoting Chinese famous brands merchandise.
April 2009	China	China challenges a US law banning imports of processed Chinese poultry, saying the ban cannot be justified on health and safety grounds.
April 2009	China	China initiates antidumping investigation against imported nylon-6 chips from the US and other countries and regions.
June 2009	US	The US and EU complain that China grants raw materials to domestic manufacturers at below-market prices.
June 2009	US	The US imposes tariffs on certain passenger vehicle and light truck tires over a 3-year period of 55, 45, and 35 percent respectively.

Table 7.3. (Continued)

Date	Complainant	Issue
June 2009	US	The US complains that China constrains exports of raw materials.
June 2009	China	China imposes antidumping tariffs ranging from 5.7 percent to 35.4 percent on adipic acid from the US.
June 2009	China	China imposes a temporary antidumping duty of 10.9 percent to 37.5 percent on polyamide-6 imports from the US, Italy, the UK, France, and Taiwan.
June 2009	China	China begins antidumping investigation into grain-oriented flat-rolled electrical steel from the US.
August 2009	US	The US complains that China breaks WTO rules by requiring all imported media products to be channeled through state-run distributors.
September 2009	US	The US imposes safeguard duties of 35 percent on Chinese tires.
September 2009	China	China complains that US safeguard duties of 35 percent on Chinese tires are in excess of the rates permitted under US international obligations to China.
September 2009	China	China announces it will maintain antidumping measures on some imported polyvinylchloride (PVC) from the US, the Republic of Korea, Japan, and Russia.
September 2009	China	China launches antidumping and antisubsidy investigations into the imports of US car parts and chicken products.
September 2009	China	China's Ministry of Commerce launches study of antidumping investigations of US and EU on China's solar photovoltaic industry.
October 2009	China	China's Ministry of Commerce issues a preliminary ruling against the US and other countries, accusing them of dumping chemical fibers in China.
November 2009	US	The US imposes tariffs of 2 to 438 percent on Chinese-made wire decking.
November 2009	US	The US imposes antidumping duties ranging from 48.99 to 98.74 percent, and countervailing duties ranging from 13.66 to 53.65 percent on seamless steel pipe from China.
December 2009	US	The US slaps antidumping duties on Chinese steel-grating products.
December 2009	US	The US imposes duties of 10 to 16 percent on Chinese steel-piping imports.
December 2009	US	The US International Trade Commission slaps punitive penalties on \$2.6 billion of oil company tubular goods from China.

Table 7.3. (Continued)

Date	Complainant	Issue
December 2009	China	China loses its appeal of a WTO ruling that its curbs on importing and distributing foreign publications and audiovisual products violate its WTO commitments.
January 2010	China	China extends antidumping measures by 5 years on imports of phenol from the US.
January 2010	US	The US starts antidumping and antisubsidy probe into Chinese steel drill pipes.
January 2010	US	The US imposes 175 percent antidumping duties on Chinese electric blankets and wire trays.
January 2010	US	The US slaps additional duties of 43 to 289 percent on imports of Chinese-made wire decking.
February 2010	China	China announces antidumping duties from 43.1 to 105.4 percent on imports of US chicken products.
February 2010	US	The US puts antidumping taxes of up to 231.4 percent on Chinese ribbons used for gift wrapping, hours after China announced the chicken duties.
February 2010	US	The US imposes preliminary duties ranging from 11 to 13 percent on steel pipes from China.
April 2010	US	The US imposes antidumping duties of up to 99.14 percent on imports of Chinese steel pipes.
April 2010	China	China slaps duties of as much as 64.8 percent on certain specialty-steel products from the US and Russia, following a preliminary ruling in December.
April 2010	US	The US Department of Commerce launches a probe into Chinese exports of aluminum products, with an initial determination scheduled for May 17.
April 2010	China	China starts two antidumping investigations into imports of optical fibers and a chemical product from the US and EU. It also levies tariffs on some nylon imports from the US and other countries.
April 2010	China	China's Ministry of Commerce imposes countervailing duties of up to 31.4 percent on some chicken products from the US.
April 2010	US	The US imposes preliminary antidumping duties of as much as 135.8 percent on glossy paper from China.
May 2010	US	The US Department of Commerce announces a final ruling to impose antidumping and countervailing duties of as much as 193.55 percent on imports of concrete steel wire from China. The duties will not come into effect until the International Trade Commission votes in June.
June 2010	US	The US Department of Commerce makes an initial ruling imposing tariffs of 15.72 percent on Chinese drill pipes.

Table 7.3. (Continued)

Date	Complainant	Issue
July 2010	China	China accepts the WTO ruling on importing and distributing foreign publications and audiovisual products.
September 2010	US	The US files for consultations regarding market access restrictions that prohibit foreign suppliers from handling renminbi-denominated card transactions.
September 2010	US	The US Department of Commerce makes a preliminary ruling imposing duties ranging from 6.18 to 137.65 percent on aluminum extrusions.
September 2010	US	The US Department of Commerce imposes duties ranging from 17.64 to 178.03 percent on Chinese coated paper for high-quality graphics.
October 2010	US	The US sets final duties of up to 61 percent on copper pipe and tube from China.
October 2010	US	The US begins investigation following petition filed by the USW.
February 2011	US	The US accuses China of creating a monopoly in its electronic payments market, allowing China Union Pay to handle most credit and debit card transactions made by Chinese consumers.
February 2011	US	The US asks WTO to rule on its allegation that Chinese imposed antidumping and countervailing duties of more than 2 percent on imports of grain-oriented flat-rolled electrical steel without sufficient evidence of unfair pricing practices or government subsidies.
March 2011	China	WTO overturns, on China's appeal, a ruling supporting US antidumping and antisubsidy tariffs against Chinese steel pipe, woven sacks, and off-road tires on the basis that the US could not simultaneously use other markets to determine the fair price of goods made in China, a nonmarket economy, and penalize it for state subsidies. The WTO did rule in favor of the US view that discounted land, electricity, and loan prices could be considered subsidies. It also found that while not all state-owned enterprises are "public bodies," state-owned banks can be so considered.
June 2011	China	China agrees to stop subsidizing wind power firms that use domestic equipment in place of imports, after the US requested WTO consultations over the Chinese subsidies.
July 2011	China	WTO rules that China's export restrictions on several raw materials unfairly raise world prices.
September 2011	US	The US sets antisubsidy and antidumping duties ranging up to 313.8 percent on coated paper from China.

Table 7.3. (Continued)

Date	Complainant	Issue
September 2011	China	China loses its appeal of the US imposition of 35 percent safeguard duties on Chinese tires.
October 2011	US	The US Department of Commerce sets preliminary anti-dumping duties of up to 193.54 percent on steel wheels from China.
October 2011	US	The US Senate, targeting China, passes bill allowing companies to seek countervailing duties on goods from countries with undervalued currencies.
November 2011	US	The US announces an investigation into Chinese-made solar panel sales.
November 2011	China	China announces an investigation into US policy and subsidies for renewable energy, wind, solar, and hydro-technology products.
December 2011	US	The US Department of Commerce announces preliminary countervailing duties of 22.34 percent and additional preliminary duties of 5 to 26 percent on high-pressure steel cylinders from China.
December 2011	China	China's Ministry of Commerce set punitive duties of up to 22 percent on large cars and sport utility vehicles exported from the United States.
December 2011	US	The US asks WTO to strike down China's heavy anti-dumping duties on US chicken products.
January 2012	US	President Obama announces plan to establish a Trade Enforcement Unit to investigate unfair trade practices.

Source: Compiled with information from *CNN Money*, March 13, 2012; *GOV.cn*, December 27, 2010; *Financial Times Global Economy*, October 8, 2009–May 18, 2010; Reuters Factbox, December 15, 2012; US-China Business Council, October 26, 2010.

due to expire in 2013. These circumstances leave China's trading partners even more anxious about competition from China. The appendix indicates how the research included this book on steel, glass, paper, and auto-parts has been used in US negotiations on trade with China (see also expert congressional testimony at U. Haley 2006, 2007; G. Haley 2007, 2009).

In the 10 years since China joined the WTO, the US trade deficit with China has grown by 330 percent. While the overall US trade deficit with the world grew from \$376.7 billion in 2000 to \$500 billion in 2010, China's share nearly tripled during the period, from 22 percent in 2000 to 55 percent in 2010. These data suggest that the growth in the US global trade deficit reflects growth in the US trade deficit with China, and that China is replacing other emerging economies as the final supplier of

finished exports to the United States (US-China Securities and Exchange Commission 2011).

The more significant trend deals with the composition of traded goods. Over the last decade, Chinese manufacturing has undergone a dramatic restructuring away from labor-intensive goods toward investment-intensive goods. Increasingly, low-cost capital rather than low-cost labor has driven production as subsidies build next-generation manufacturing facilities and produce advanced-technology products for export. In 2000, exports of labor-intensive products constituted 37 percent of all Chinese exports; by 2010, this percentage fell to 14 percent. The global shifts in specialization have serious welfare implications for the US economy. From 2004 to 2011, US imports of Chinese advanced-technology products grew by 16.5 percent on an annualized basis, while US exports of those products to China grew by only 11 percent. In August 2011, US exports of advanced-technology products to China stood at \$1.9 billion, while Chinese exports of advanced-technology products to the United States reached \$10.9 billion, setting a record one-month deficit of more than \$9 billion. On a monthly basis, in 2011 the United States imported more than 560 percent more advanced-technology products from China than it exported to that country (US-China Economic and Security Review Commission 2011). By contrast, the monthly US trade surplus in scrap and waste reached a record high of \$1.1 billion in August 2011. The annual US trade surplus in scrap and waste grew from \$715 million in 2000 to \$8.4 billion in 2010, representing an increase of 1,187 percent, or 28 percent per year on an annualized basis.

The US trade deficit with China, which has ballooned to account for more than half of the total US trade deficit with the world, has had welfare implications, including lost US jobs. Researchers have disputed the exact number of US jobs lost to China trade but not that jobs have been detrimentally affected—in testimonies to the US-China Economic and Securities Review Commission (2011), the Peterson Institute's C. Fred Bergsten has estimated 600,000 jobs lost on the low end, while the Economic Policy Institute's Robert Scott has estimated 2.4 million jobs lost on the high end.

By mid-2011, the United States had brought seven cases against China at the WTO concerning subsidies or grants. Of the seven, four were settled through consultation, two were decided in favor of the United States, and one remained undecided (US-China Economic and Security Review Commission 2011). The cases dealt with integrated circuits (settled), auto parts (holding for US sustained on appeal), taxes (settled), intellectual property rights (held for US), financial services (settled), grants and loans (no resolution), and wind power (settled).

This section covers three government policies surrounding subsidies that we can broadly classify as focusing on domestic consumption or on domestic production. The WTO permits certain responses from importing nations that can prove they suffered material injury due to unfair trade practices. Trade remedies that shield domestic markets through affecting consumption primarily include antidumping and countervailing duties. The Chinese government has also adopted another policy of indigenous innovation that subsidizes high-technology production as well as identifies technology transfer as a prerequisite for foreign companies to access China's large government-procurement market. We discuss each of these policies in turn.

Consumption: Antidumping and Countervailing Duties

Antidumping duties constitute the most popular trade remedy in worldwide trade disputes. US law defines dumping as foreign products exported to the US at prices below fair value, that is, either below the prices of comparable goods sold in the exporters' home market or below the costs of production. When dumping can be shown to have occurred, antidumping duties can be applied. For economic analyses of antidumping and countervailing duties see Feenstra (1995).

Since 2002, China has concluded nine free-trade agreements and started negotiations for five more. A precondition to negotiation has been agreement by the other country to grant China market-economy status (US-China Economic and Security Review Commission 2011). These preconditions target eliminating certain restrictions placed upon China during accession to the WTO: In particular, countries that institute antidumping proceedings against China can draw price comparisons from third-party countries, in lieu of China, to show dumping by Chinese companies. Similarly, to identify illegal subsidies and to calculate countervailing measures, instituting countries may refer to prices and conditions in third-party countries in lieu of China. Under the terms of the Accession Protocol, however, China's nonmarket-economy status will expire in 2016, when these provisions will cease to have effect. However, applicable US domestic law will continue to have effect beyond 2016, adding pressure to the trade filings.

In 2005, Canada became the first country to impose countervailing duties on Chinese products under the WTO system, raising the issue of the permissibility in WTO law of using such duties against nonmarket economies (Zhao and Wang 2008). In 2007, the United States joined Canada by imposing its own countervailing duties against China. In 2007,

the United States Department of Commerce altered a long-standing policy of not applying countervailing-duty law to nonmarket economies and initiated eight countervailing and antidumping duty investigations on Chinese imports (U. Haley 2006, 2007; G. Haley 2007, 2009). The change has brought heated debate on trade-remedy policies and nonmarket economy issues among lawyers and policymakers.

Governments resort to countervailing duties less often than antidumping duties. From January 1, 1995, to December 31, 2006, WTO reporting members were notified of 3,048 antidumping and 191 countervailing initiations (Zhao and Wang 2008). The United States had not applied countervailing duties to China, as China had been classified as a "nonmarket economy" since 1981. This policy rested on two principles advanced in 1984 and confirmed by a federal appeals court. On November 21, 2006, the US Department of Commerce announced its decision to initiate an antidumping and countervailing-duty investigation on imports of coated free-sheet paper from China. This decision changed the long-standing precedent that the nonmarket economies had exemption from US countervailing-duty investigations, as the government could not identify or measure the extent of subsidies in these markets. In the case of coated free-sheet paper, the US Department of Commerce found several countervailing subsidies provided by the Chinese government, but the US International Trade Commission found no injury to US industry, and the first case ended in 2007 without a countervailing-duty order. However, the change in the Department of Commerce's policy opened the gate for more successful countervailing-duty cases on China, including the solar industry (see Haley and Haley 2012b).

On October 19, 2011, a strategic group of seven US solar manufacturers, founding members of CASM, filed petitions with the USITC and Department of Commerce's International Trade Administration seeking relief for the US domestic producers injured by Chinese imports of crystalline silicon photovoltaic (CSPV) products. On March 20, 2012, Commerce announced its affirmative preliminary determination in the countervailing-duty investigation. Suntech Power received a preliminary countervailing duty of 2.9 percent, Trina Solar 4.7 percent, and all other Chinese manufacturers 3.6 percent. On May 17, 2012, Commerce announced preliminary antidumping duties on Chinese manufacturers of CSPV cells. Commerce assessed preliminary tariffs against Suntech Power and Trina Solar of 31.22 and 31.14 percent, respectively. Commerce also assessed preliminary tariffs against other Chinese manufacturers, including JA Solar, Yingli, Hanwha SolarOne, Canadian Solar, LDK Solar, and Jiawe Solar China of 31.18 percent. All other Chinese manufacturers received a preliminary tariff of 249.96 percent. On November 7, 2012,

the US International Trade Commission voted unanimously in favor of the duties, clearing the way for the Department of Commerce to issue five-year anti-dumping and countervailing duty orders on Chinese imports (Palmer 2012).

In May 2012, China filed WTO cases challenging US antisubsidy tariffs on 22 Chinese goods. Beijing appeared to be challenging Washington's general approach to subsidies and dumping as well as specific policies on individual industries. China accused the United States of improperly using antidumping and countervailing duties to shield US companies from competition. "The relevant practices constitute the abuse of trade remedy measures which undermines the legitimate interests of China's enterprises," Beijing's mission to the WTO stated (Associated Press 2012). The Chinese statement argued that the US trade measures affected Chinese exports to the United States worth \$7.3 billion and included steel, paper, and solar cells.

Production: Indigenous Innovation

In 2006, Beijing announced plans to increase R&D spending from 1.5 percent of GDP to 2.5 percent by 2020 in an effort to move China into higher-value-added and innovative manufacturing. A nationwide network of regulations and plans known loosely as "indigenous innovation" identified the subsidies that encouraged domestic high-technology production. Indigenous innovation closely ties to the Chinese government's procurement, including 16 megaprojects that the National Medium- and Long-Term Plan for the Development of Science and Technology (2006–2020) (MLP) described as "assimilating and absorbing" advanced imported technologies to "develop a range of major equipment and key products that possess proprietary intellectual property rights." The government's procurement market and subsidies have become the key drivers for these projects.

Because of opaque ownership, no definitive published value for Chinese government procurement exists; however, by all accounts, the government in some form remains China's largest consumer. The US-China Economic and Security Review Commission (2011) identified some problems with measuring government procurement in China. In China's official statistics, SOEs include only wholly state-funded firms and exclude shareholding cooperative enterprises, joint-operation enterprises, limited-liability corporations, and shareholding corporations owned mostly by the government, public organizations, or the SOEs. In 2009, the Chinese government estimated that its procurement market surpassed \$100 billion. That

same year, the Organization for Economic Cooperation and Development, using data from 2006, estimated the SOEs' share of China's GDP at 29.7 percent, but the private sector did not account for the remaining 70 percent. A US-China Economic and Security Review Commission study conducted in 2011 concluded that the state's share of the Chinese economy exceeded 50 percent. The European Union Chamber of Commerce (2011) in China estimated the size of China's government procurement market at \$1 trillion. The US government has argued that SOEs and provincial and local government agencies form part of China's governmental procurement. China has responded that central, provincial, and local SOEs and provincial and local government agencies do not form part of governmental procurement, thereby hindering China's accession to the WTO's 40-member "Agreement on Government Procurement."

Hout and Ghemawat (2010) indicated several subsidies that China is using to propel indigenous innovation, such as tax incentives, including accelerated depreciation of investments in R&D facilities and tax breaks on returns from venture-capital investments in technology-based start-ups; cheap loans, and special-funding of domestic technologies to replace imported technologies; and national, provincial, and municipal procurement policies to favor indigenously developed technologies.

McGregor (2011) detailed several of the underlying policies and institutions behind China's indigenous innovation. In December 2009, China's Ministry of Science and Technology (MOST), Ministry of Finance, Ministry of Industry and Information Technology, and SASAC codified a catalog of 240 types of industrial equipment into 18 categories that received governmental tax incentives, science and technology subsidies, and priority listings for domestic production. In November 2011, the State Council released a draft of the Government Procurement Law defining a "domestic product" as one made within China's borders with "domestic manufacturing costs exceeding a certain percentage of the final price." As patent filings became part of SOEs' performance evaluations, local governments gave subsidies to pay for patent filings that often exceeded budgeted costs. If one accepts the European Chamber's figures, China's indigenous-innovation policies and official procurement catalogs wall off 17 percent of China's \$5.9 trillion economy from foreign participation.

McGregor (2011) sketched how China's domestic wind industry responded to the indigenous innovation regulations on domestic content and government procurement. In 2005, the NDRC required 70 percent domestic content in all wind turbines in China. The 2006 Renewable Energy Law increased subsidies for wind-energy projects and domestic capacity expanded. The 2007 Foreign Investment Industry Guidance

Catalogue listed wind-turbine manufacturing as an encouraged industry for foreign participation, but foreign firms that manufactured wind turbines over 1.5 MW had to engage in domestic joint ventures (JVs) or partnerships. Vestas, Gamesa, and Suzlon still decided to operate independently, but others, such as GE, entered into JVs. The Chinese government encouraged technology transfers, provided financial subsidies, instituted preferential tax policies, and provided preferential treatment in project tendering and bidding to fan domestic companies' growth. In 2004, foreign wind-turbine manufacturers held 75 percent of the Chinese market. By 2009, the three largest domestic players, Sinovel, Goldwind, and Dongfang alone held 60 percent of the domestic market, while foreign firms held 14 percent.

Various Chinese governmental agencies disburse indigenous-innovation subsidies; MOST funds science parks, research labs, and the megaprojects. The China Development Bank provides soft loans for projects. The Export-Import Bank of China creates special accounts for innovative enterprises. In November 2008, China responded to the global financial crisis with RMB 160 billion for indigenous innovation, including RMB 27 billion for the first phase of work on three megaprojects: core electronic devices, semiconductors, and wireless broadband. In a few months, stimulus money launched another five Chinese megaprojects.

In the auto-parts industry, the Chinese government has withheld subsidies from foreign firms to obtain cutting-edge technology. For example, the Chevrolet Volt, a plug-in hybrid manufactured by the largest foreign auto company in China, General Motors (GM), incorporates three important technologies sought by the Chinese government: electric motors, complex electronic controls, and power-storage devices, including batteries and fuel cells. The Chinese government has withheld a \$19,300 per car subsidy from GM, while bestowing it on Chinese competitors of plug-in electric cars such as BYD, until GM provides its core technology to a Chinese car company. GM has refused to comply so far. However, without the subsidy, the company has difficulty competing in the Chinese market (Bradsher 2011c; US-China Economic and Security Review Commission 2011). GM has denied that it experienced any pressure from the Chinese government (*Automotive News China* 2011a, 2011b).

IMPLICATIONS AND FUTURE RESEARCH

China's state capitalism resembles what Hancke (2010) termed a coordinated-market economy where correctly calibrated, complementary

institutions across states, provinces, and municipalities reinforce one another and determine market efficiencies. Hancke indicated that coordinated market economies showed greater willingness to invest in worker skills and narrower market niches than firms in liberal market economies such as the United States and the United Kingdom. Consequently, Hancke argued that high-skill and high-productivity activities will concentrate in core, coordinated market economies. Lower-value-added, lower-skill, and lower-price activities will move to liberal market economies. Subsidies to Chinese manufacturing have spawned many implications for firms, the global economy, and researchers.

For Firms

Haley and Schuler (2011) saw Hancke's (2010) observations reflected in how global consumption and production subsidies affected firms' manufacturing location and technology development in the solar PV industry. China's consistent production subsidies, coupled with other countries' more uncertain ones, shaped firms' location decisions on development of R&D and on manufacturing, with unintended effects on employment. Consistent government subsidies for R&D had helped the United States become the technology leader in solar PV; yet massive Chinese production subsidies had encouraged many to move manufacturing to China after developing their technology in the United States. The urge to reduce end-user costs could also affect firms' future investments in technology, leaving US consumers with no option but to buy older and more-established technology products from China (Haley and Haley 2012a, 2012b).

Shipping costs constitute more than 5 percent of the cost of goods sold for US solar manufacturers like First Solar and less than 3 percent for a leading Chinese firm. This could lead to a bifurcation in manufacturing for some processes (e.g., c-Si): firms could make lightweight cells in China and ship them to the United States (or Mexico) for assembly into modules. Essentially, higher-value manufacturing would move to Asia, while lower-value, lower-technology manufacturing would remain in the United States. Higher-technology firms, such as cell manufacturers, would continue to stay in China. Firms using thin-film technologies would see the United States as a more appealing manufacturing base, as large percentages of thin-film cells and modules are manufactured together. The manufacturing facilities for cells on superstrates/substrates that form the modules must also include the higher-technology facilities. Firms

manufacturing thin-film cells independently from modules (e.g., Energy Conversion Devices, which manufactures cells in the United States and is moving module manufacturing to Mexico) could also bifurcate manufacturing, affecting US competitiveness.

However, firms' cost calculations also need to incorporate political resistance. As we stated at the beginning of chapter 1, in 2011, responding to Chinese production subsidies, primarily loans, Evergreen Solar, the third-largest US panel manufacturer, withdrew its production to China, with the goal of exporting production back to the United States. On a wintry morning in February 2011, when moving operations from Massachusetts to China, Evergreen Solar's senior manager in charge of government and public relations communicated to us his perceptions of the importance of market strategies: "You are a business professor. You should know that we made the right business decision. Capital seeks the highest rate of return. This is something we learn in business schools, and that is what we are doing as a well-run company."

Yet Evergreen's market strategy has had unintended nonmarket ramifications and encountered varied political opposition (Haley and Schuler 2011). Understanding that outsourced production may satisfy US demand but create value and jobs elsewhere, key stakeholders such as the United Steel Workers labor union have argued convincingly for domestic-content legislation.⁶ The National Defense Authorization Act for 2011, signed into law by President Obama, includes a new provision citing that the US Department of Defense, the world's largest government purchaser of solar panels, can only purchase PV modules manufactured in the United States or in countries that have signed the WTO's government-procurement agreement. As noted earlier, China has not accepted this agreement. Consequently, China-based firms will have to adjust their market strategies to accommodate the Buy America provisions that support US-based employment by setting up manufacturing facilities in the United States.⁷ The Massachusetts state government is suing Evergreen for some of its money back. Local media has highlighted how the firm took Chinese subsidies with promises to create jobs in China after receiving the largest production grant in Massachusetts's cash-strapped history.⁸

The managers of non-Chinese firms need to understand the role of subsidies in the competitiveness of Chinese firms and approaches to systematic measurement of that role. In their formulations of competitive strategy, these firms should either attempt to overcome the competitive advantages stemming from Chinese subsidies or should choose to target market segments where these advantages have less significance.⁹

Firms, too, have to incorporate subsidies into a long-term, interactive planning process, including competitors' and foreign governments' behaviors. Political forces can abruptly affect subsidies (see Haley and Haley 2008). For example, the November 2007 WTO subsidy-reduction agreement between the United States and China cut export subsidies to foreign firms located in China but maintained subsidies to Chinese firms. This shows how subsidy-based cost advantages of foreign firms located in China can suddenly evaporate. Second, firms that offshore to, or source or import from, China may suffer price shocks if they fail to discount fluctuating, subsidy-based cost advantages. Our research (Haley and Haley 2008), showed that under scrutiny, subsidies from Beijing often dry up, only to be replaced to varying degrees by subsidies from provincial and local governments that use them to support employment, build self-sufficiency, and promote import-substitution locally. Firms should establish relationships with industry and government officials in China so that they know the source of subsidies and can calculate interactively the risk of reduction and subsequent price increases. Before foreign companies cut other suppliers loose in favor of lower-priced Chinese sources, they should be mindful that Chinese firms' prices may fluctuate abruptly as subsidies shift. Rational foreign firms should therefore retain at least some original supplier relationships and cultivate alternate ones until Chinese suppliers prove reliable over the medium term. For effective strategies, foreign firms' managers should initiate serious efforts to understand the political forces at work impacting Chinese subsidies to gauge the probabilities of their actual reduction or removal.

For the Global Economy

The Chinese subsidy practices we cover have impacted the global economy beyond the boundaries of the steel, glass, paper, auto-parts, and solar industries on which we focus. For example, the substantial indirect energy subsidies that benefit the Chinese steel industry also lower costs in varying degrees for other Chinese manufacturing firms. Our findings contradict the widespread belief that China's enormous success in the past two decades as an exporting nation derives primarily, if not exclusively, from low labor costs and from its government's deliberately undervaluing its currency. Chinese labor costs may continue rising as they have done and trading partners' pressures may result in marginally increasing the value of the yuan, thereby making Chinese products more expensive to

foreigners. However, Chinese producers' low costs stemming from extensive, systemic government subsidies will continue, contributing substantially to their competitiveness in global markets.

The extent of Chinese industrial subsidies, the political processes that underlie their disbursement, and the meshing of Chinese production into global supply chains also augur a period of heightened uncertainty as well as international booms and busts. In August 2012, the *New York Times* (Bradsher 2012) reported on some of the effects of these subsidies on Chinese industries and the intertwined, global economy. Unsold goods were piling up in China at the fastest rate since surveys of inventories began in April 2004. The glut of products, which included steel, glass, paper, autos, and solar panels, had produced price wars and led manufacturers to redouble efforts to export what they could not sell domestically. As we have highlighted in previous chapters, the overcapacity that stems from government subsidies appears a primary source of these developments. In the auto industry, manufacturers refused to cut production and were pressuring financially struggling dealers to accept delivery of cars under their franchise agreements. The Chinese government responded by blocking or adjusting economic data so the severity of inventory overhang would not affect investors' confidence. China's Public Security Bureau, for example, halted the release of data on falling demand in autos reflected in new-car registrations. In 2012, the government also repeatedly revised data on the steel industry after a new method showed a steeper downturn than the government had acknowledged. Similarly, the government had not released information about the number of empty apartments (which affected new construction and therefore glass demand) since 2008. Enormous and unpredictable amounts of steel, glass, and paper on the global market, and the commoditization of products such as cars, appear inevitable. The price for solar PV cells fell 66 percent from mid-2010 to the mid-2012, mostly because of Chinese overproduction and worldwide glut. In the United States over 13 firms went bankrupt (Haley and Haley 2012b). The impact has extended to Germany, Australia, India, and China. Jigar Shah, who put together CASE, said all major Chinese solar companies expected economic difficulties because of overproduction. "Everything's crashing right now. The Chinese are maybe overplaying their hand" (Kilzer 2012).

The subsidies provided by the central, provincial, and local governments have inhibited the consolidation of manufacturing facilities and the reduction of excess capacity that normally would result from Chinese firms' efforts at lowering costs to increase competitiveness in global markets. The provision of lower costs through subsidies has removed

firms' incentives to lower costs through economically sound actions that result in achieving economies of scale and in shedding excess production capacity. Thus, many Chinese firms are economically inefficient in relation to their non-Chinese competitors, but Chinese subsidies overcome those inefficiencies and make those firms globally competitive (see Doom 2012).

When the central government removes subsidies—for whatever reason—the provincial and local governments fill in the gaps. We have attempted to discuss some of the political dynamics of state capitalism in chapter 1. The provincial and local governments want to support employment, promote import substitution, and build self-sufficiency locally through the use of subsidies, just as the central government wanted to do nationally when initially providing subsidies. While China's central government now wants to position certain domestic firms as price makers, rather than price takers, by moving them up the value chain, local governments do not want to bear the restructuring costs that these efforts entail. The central government may remove a subsidy or subsidies because of trading partners' pressures. However, provincial and local governments replace them, resulting in pursuit of the same objectives by the same means, although in each instance with narrower, geographic focus. This might explain the apparently high tolerance of inconsistent policies between the levels of government in China. The central government can point to national compliance with international trade agreements, with knowledge that much of what it really wants to happen will occur at provincial and local governmental levels.

Government officials from national and regional trading blocs should understand Chinese subsidies' extensive contributions to Chinese firms' global competitiveness, the difficulties of obtaining reliable data on these subsidies, and the frequent replacement by the provincial and local governments of subsidies removed by the central government. Recognition and understanding of these realities about Chinese subsidies should result in national and regional blocs' government officials expending greater effort to identify and to measure them, in setting a very high priority on addressing them, and in including provincial and local governments' policies as well as the central government's policies in trade negotiations with China.

For Researchers

Future research could incorporate some dynamism into our understanding of both governments' and firms' strategic behaviors. Brander (1995)

showed that most economic models of strategic trade policy rely heavily on one-shot or static models of both oligopoly and government-policy formulation. However, long-term interactions and retaliations between firms and governments appear the rule. Economic models, however have not captured the appropriate differential-game versions of strategic interactions with rational calculations.

Researchers drawing on strategic-management concepts can explore the long-term ramifications of subsidies for several of the industries highlighted in this book (steel, glass, paper, auto parts, and solar) as they affect firm, governmental and national interests. Retaliation appears as a regular cry when governments use some of the policy instruments we have identified (see Haley and Haley 2012b). However, as we have argued, retaliation does not seem rational, and neither the United States nor China has engaged consistently in retaliatory policies. Our research however, has largely been static so far. More realistic scenarios must incorporate interactive elements that mold strategic intent and action not only of domestic firms, but also of foreign firms and governments.

Future research could also augment our measurement of subsidies through adding more variables. Though we included in our measurements of subsidies direct, firm-level data hitherto ignored, we also excluded many variables that researchers have noted as providing subsidy effects to firms. The variables we considered but did not incorporate in our research include the subsidy effects of an undervalued currency and of brand-building subsidies (see G. T. Haley 2009). Consequently, our measurement of subsidies represents the tip of the iceberg, awaiting the inclusion of many more variables to capture more fully a complex and highly influential global reality.

NOTES

1. In economics, rent-seeking deals with obtaining excess returns in competitive markets through manipulating social or political environments in which economic activities occur, rather than through creating new wealth.
2. Yoffie and Milner (1989) defined a strategic group as one or more firms following similar international-trade, manufacturing, and competitive strategies.
3. Mercom Capital showed that the solar PV industry's top five debt deals in 2010 emanated from the state-owned China Development Bank to Chinese firms, including a credit facility of \$8.9 billion to LDK Solar; a loan facility of \$7.3 billion to Suntech; a loan of \$6.3 billion to Yingli; a loan of \$4.4 billion to JA Solar; and a loan facility of \$4.4 billion to Trina Solar.
4. See *Leshan News*, March 23, 2008. <http://www.leshan.cn/lnews/news/bwsd/userobject1ai153105.html>.

5. Brean Murray, Carret and Co.
6. On September 9, 2010, the USW filed a petition under Section 302(a) of the Trade Act of 1974 with the USTR accusing China of illegally subsidizing and protecting firms that export green-tech products, including solar PV.
7. In 2010, China's NDRC publicly issued a call for China's energy industry to broaden operations overseas.
8. See Sato's (2011a, 2011b, 2011c) three-part investigative report for the *Lowell Sun on Evergreen Solar and our research*.
9. We are indebted to an anonymous reviewer for this observation and for other ideas that we have woven into this subsection.