Shedding Light on Energy Subsidies in China:

An Analysis of China's Steel Industry from 2000-2007

Usha C. V. Haley, Ph.D.

JANUARY 8, 2008

Prepared for the Alliance for American Manufacturing

Alliance for American Manufacturing

AAM

Keeping America Strong

Table of Contents

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

- In 2007, China is the largest producer and consumer of steel in the world, with 40 percent of the global market. Much has changed for China's steel industry in the last 5 years. In 2005, China went from a net steel importer to a steel exporter. In 2006, China became the largest steel exporter in the world by volume, up from fifth largest in 2005. Iron and steel accounted for 28 percent of total industrial consumption in China.

- Energy subsidies fell in 2002 and 2003, after China joined the WTO. However, the subsidies surged in 2004 and continued to grow exponentially till today, along with China's rise as the largest producer and exporter of steel in the world, and with steel's designation as a strategic industry for China. From 2000 to 2006, total energy subsidies to steel grew by 1365 percent. In 2007, energy subsidies to Chinese steel are estimated at approximately $15.7 billion, showing a 3800 percent increase since 2000; similarly, in 2007, Chinese production of steel and Chinese global steel exports (including to the USA) are estimated to grow by 289 percent and 1276 percent from 2000.

- The central government's policies of consolidating the steel industry have failed. The Chinese steel industry is becoming more fragmented, while the rest of the world is concentrating production. Every Chinese province and region wants its own steel mill, and local governments provide lavish benefits to their steel industries. The forecasted growth of Chinese steel supply in 2007 is 19.3 percent, compared to 25 percent and 26.4 percent in 2005 and 2006, respectively.

- *Total energy subsidies* to Chinese steel from 2000 to mid-year 2007 reached $27.11 billion. Energy subsidies to Chinese steel since 2002 (following China's WTO entry) through mid-year 2007, approximated $25.07 billion. Energy subsidies included subsidies to thermal and coking coal, electricity and natural gas.

- *Thermal-coal subsidies* to Chinese steel from 2000 to mid-year 2007 reached $11.16 billion. From 2002 (following China's WTO entry) through mid-year 2007, the subsidies approximated $10.21 billion.

- *Coking-coal subsidies* to Chinese steel from 2000 to mid-year 2007 reached $15.29 billion. From 2002 (following China's WTO entry) through mid-year 2007, the subsidies approximated $13.88 billion.

- *Electricity subsidies* to Chinese steel from 2000 to mid-year 2007 reached $916.39 million. From 2002 (following China's WTO entry) through mid-year 2007, the subsidies approximated $912.97 million.

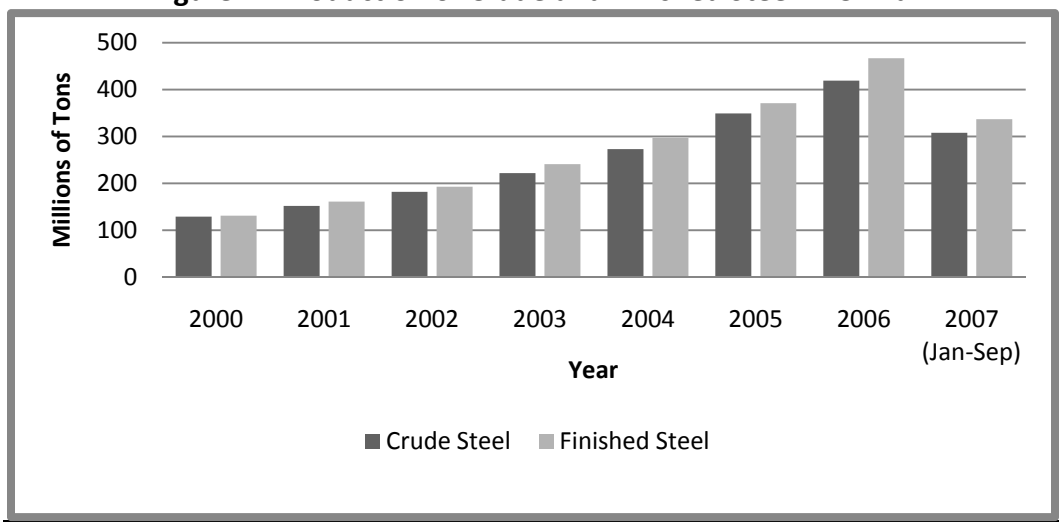
- *Natural-gas subsidies* to Chinese steel industry from 2000 to mid-year 2007 reached $54.12 million. From 2002 (following China's WTO entry) through mid-year 2007, the subsidies approximated $66.75 million.

- Statistical analysis shows that energy subsidies have a very strong correlation with Chinese steel exports and US steel imports from China. Indeed, one can almost perfectly predict China's steel exports from its energy subsidies.

INTRODUCTION

In 2007, China is the largest producer as well as consumer of steel in the world, representing 40 percent of the global market. Much has changed for China's steel industry in the last 5 years. In 2003, China imported 43.2 million tons of semi-finished and finished steel products, or about 13 percent of the global steel trade flow. In late 2005, China went from a net steel importer to a steel exporter. In 2006, China became the largest steel exporter in the world by volume, up from fifth largest in 2005. In 2006, China claimed 34 percent of the global steel production of 1.24 billion tons, displaying a six year Compounded Annual Growth Rate (CAGR) of 23 percent and enormous ramping up of domestic supply[1]. In the first 9 months of 2007, China produced 308 million tons of crude steel and 337 million tons of finished steel. Figure 1 shows the growth in Chinese production of crude and finished steel.

Figure 1. Production of Crude and Finished Steel in China



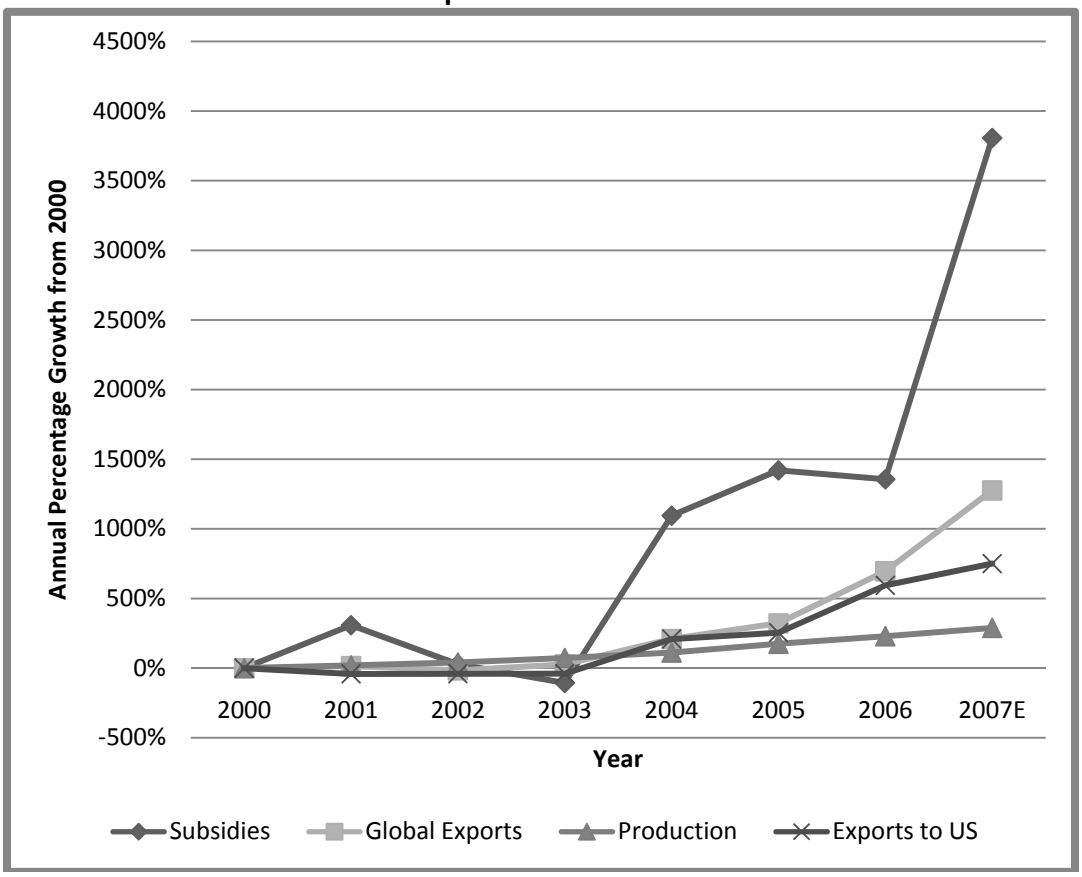
Source: CEIC, Mysteel

The Chinese steel industry as it exists today stems from government intervention, oversight and subsidies. Previous reports have documented the off the book and on-the book

[1] US Department of Commerce, ISI Analytics

subsidies that permeate Chinese industry, including steel[2]. This report concentrates on energy subsidies to the Chinese steel industry from 2000 to 2007. Drawing on published research and public data sources, many from the Chinese government, the research shows that energy subsidies fell in 2002 and 2003, immediately after China joined the WTO; however, the subsidies surged in 2004 and have continued to grow exponentially since then, corresponding to China's rise as the largest producer and exporter of steel in the world.

Figure 2. Growth of China's Energy Subsidies, Crude Steel Production and Steel Exports from Base Year 2000



Sources: Mysteel, Iron and Steel Statistics Bureau, Citigroup Global Markets, Business Standard, United States International Trade Commission, author's estimates

[2] See U. C. V. Haley (2006) Testimony on "Chinese Economic Planning and the Role of Subsidies," Hearing on China's WTO Compliance and Industrial Subsidies, the US-China Economic and Security Review Commission, Washington, DC, April 4. Available at http://www.uscc.gov/hearings/2006hearings/written_testimonies/06_04_04wrts/06_04_04_haley.php; and, Wiley Rein LLP (2007) "Money for Metal: A Detailed Examination of Chinese Government Subsidies to its Steel Industry", July.

Figure 2 traces how energy subsidies to Chinese steel have continued to rise along with the industry's growth and exports. By 2006, total energy subsidies to steel had grown by 1365 percent over 2000. Energy subsidies to steel exceeded $7.8 billion in the first half of 2007, growing 25 percent since 2006. In 2007, energy subsidies to Chinese steel are estimated at approximately $15.7 billion, showing a 3800 percent increase since 2000; similarly, in 2007, Chinese production of steel and Chinese global steel exports (including to the USA) are estimated to grow by 289 percent and 1276 percent from 2000[3]. In 2007, Chinese steel exports to the USA alone are estimated to grow by 751 percent from 2000[4]. Growth of Chinese steel exports to the USA may have decelerated relative to the rest of the world because of the declining value of the dollar in 2007[5].

The Chinese government has not acknowledged the presence of energy or any other subsidies to its domestic steel producers in its declaration to the World Trade Organization (WTO). The WTO requires annual notification from members on subsidies they maintain and encourages additional, needed information on subsidies. On April 13, 2006, China, a WTO member since 2001, submitted an overdue subsidies notification to the WTO in which it identified 78 subsidy programs from 2001 to 2004, but none to the steel industry. The WTO specifies that members should provide sufficient information "to enable other members to evaluate the trade effects and to understand the operation of notified subsidy programs." China's report stated that several central government ministries and agencies distributed and

[3] Growth in China's global steel exports is derived from data from the Iron and Steel Statistics Bureau, Mysteel, and A. Mathur (2007), "Chinese Steel Exports Boom Despite Curbs", Business Standard, November 24; growth in China's steel production is derived from data from Citigroup Global Markets (2005), "Metals-Steel", August 30, and Mysteel.

[4] Growth in China's exports to the USA is derived from United States International Trade Commission data.

[5] See remarks of Cheng Siwei, Vice Chairman of National People's Congress, and Xu Jian, Director of Central Bank, quoted in A. Lovasz and S. White (2007), "Dollar Hits Low against the Euro", Bloomberg News, November 7; and analysis by Credit Suisse (2007) "US Steel Sector. May US Steel Imports – China Imports Rise", June 26.

monitored subsidies, and extensive legislation in China supported the subsidies. Yet, surprisingly, no statistical data existed in China to assess the trade effects of any subsidy or even the total annual amounts budgeted to these subsidies. Foreign-Invested Enterprises (FIEs)/Foreign Equity Joint Ventures and Agriculture/Animal Husbandry appeared as the primary beneficiaries in China's notification. China's subsidy notification to the WTO ignored subsidies to the steel industry by:

- Concentrating on subsidies to FIEs to invest in key strategic Chinese sectors and ignoring most subsidies that reduce local steel producers' operating and production costs vis-à-vis foreign producers[6];
- Concentrating on subsidy programs supported by the central government and ignoring all programs offered by provincial and municipal governments which greatly benefit domestic steel producers in China; and,
- Ignoring the subsidy effects of maintaining a cheap currency, as well as subsidies in several sectors including commercial banks' lending policies or other financial preferences that infuse the steel industry[7].

I. CHARACTERISTICS OF THE STEEL INDUSTRY IN CHINA

In July 2005, the National Development and Reform Commission (NDRC) released the China Iron and Steel Industry Development Policy highlighting steel as a strategic and pillar

[6] On November 29, 2007, China agreed to terminate a dozen subsidies and tax rebates. At the time of writing this report, details of this agreement are still pending. However, the agreement mostly affects exports by Chinese companies that have foreign investors or are joint ventures with foreign companies, not the steel industry. See S. R. Wesiman (2007), "China Agrees to Remove Certain Subsidies", New York Times, November 30.

[7] For a more complete discussion of China's subsidy notification to the WTO, see U. C. V. Haley (2007) Testimony in "Support for the Non-Market Economy Trade Remedy Act," Committee on Ways and Means, Subcommittee on Trade, 110th Congress, Washington, DC, March 15. Available at http://waysandmeans.house.gov/hearings.asp?formmode=view&id=5688

industry. The policy announced the central government's aim of consolidating and modernizing the industry, with the specific goal of "strategic reorganization". The policy also announced the creation by 2010 of two 30-million-ton annual capacity producers and several "internationally competitive" companies at the 10-million-ton level.

In October 2005, in a joint statement to the WTO Transitional Review Mechanism on China's accession, the United States, Canada and Mexico noted that two articles on the state's role in implementing policy could violate WTO anti-subsidy rules. Specifically, article 16 of the Chinese policy provided for various types of state support in developing and modernizing the industry. Also, article 18 "encouraged" the Chinese steel industry to use domestically produced equipment, and to import equipment only if domestically made equipment was insufficiently advanced, unavailable or in short supply[8].

The central government has also repeatedly announced its intention to control and to direct the steel industry. For example, in its Steel Policy of 2005, China banned foreign acquisition of large steel mills. The Eleventh Five-year plan for National Economic and Social Development of the People's Republic of China also reiterated the principle of using central control to eliminate the obsolete, to restructure, to upgrade industrial product and to lower consumption of raw materials[9]. Yet, in 2007, the Chinese steel industry is characterized by overcapacity and fragmentation and is the arena of political struggles between the central and the provincial governments.

Fragmentation

Beijing has learned that fewer producers can lead to stronger pricing power in the global markets, and its policies' objectives seem aimed in that direction. The Steel Policy of 2005

[8] S. Cooney (2006), "Steel: Price and Policy Issues", CRS Report to Congress, August 31.
[9] Outline of the Eleventh Five-Year Plan for National Economic and Social Development, available at http://en.ndrc.gov.cn/hot/W020060531535878205383.jpg

emphasized the government's proclaimed determination to avoid inefficient use of resources, including capital, energy, and raw materials (such as iron ore and coking coal), and to protect both intangible (such as environmental) and tangible assets. Raising the equity requirements for steel plants also highlighted the central government's efforts to curb excess capacity. These attempts at consolidation synchronize with Beijing's policy of building 150 State Owned Enterprises (SOEs) as global champions[10, 11].

The central government 's policies of consolidating the steel industry have failed. As Figure 3 shows, the top 15 producers controlled 48 percent of domestic production in 2004, but their aggregate share dropped to 43 percent in 2006. These data indicate that the central government can strongly influence the major producers' expansion, yet production is shifting out of Beijing's radar and weakening the major producers' market power. The Chinese steel industry is becoming more fragmented, while the rest of the world is moving towards more concentrated production.

The major Chinese steel producers' production rankings bring the industry's fragmentation into sharper focus. Although China has the world's largest steel industry, in 2004 only one Chinese producer, Shanghai Baosteel, ranked among the world's ten largest producers. Only two Chinese producers, Shanghai Baosteel and Anshan (now Anben), produced more than 10 million tons in that year, while eight reached that level in 2005. In 2005, 25 Chinese producers ranked in the top 80 in the world. Yet these producers accounted for less than 40 percent of total Chinese production[12].

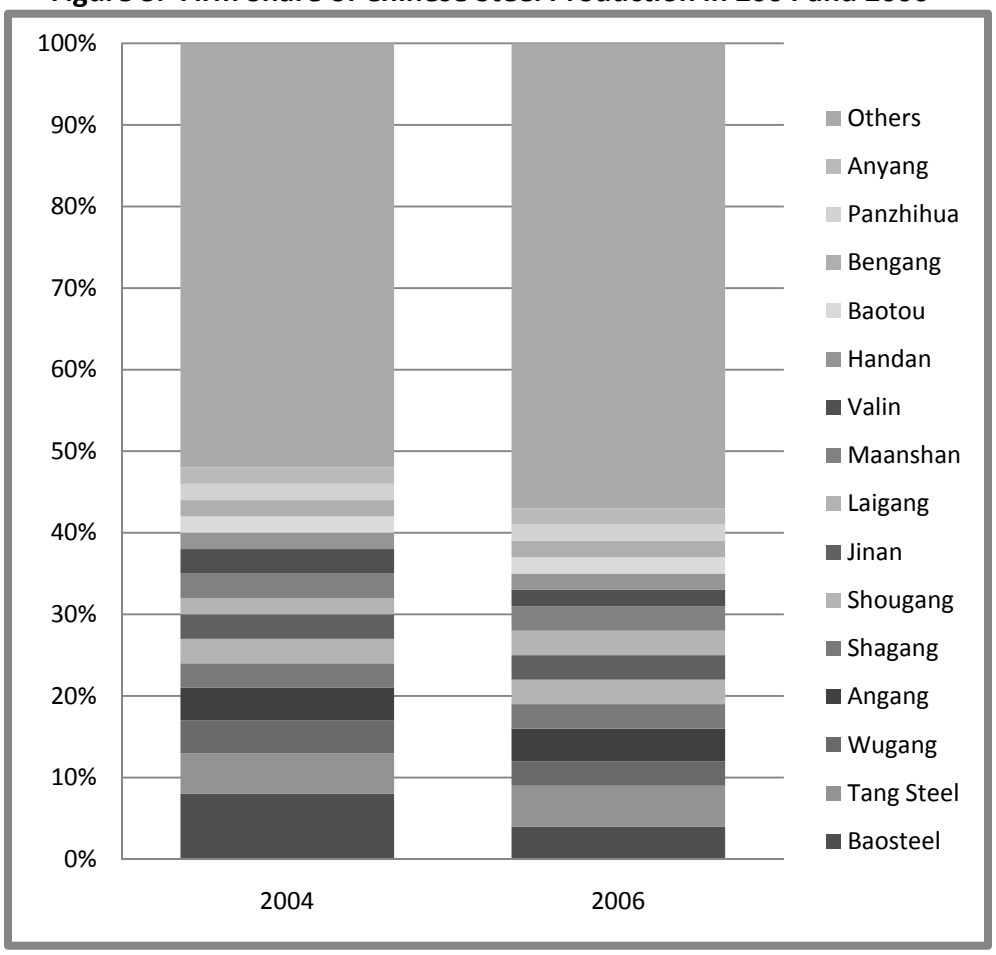
---

[10] See G.T. Haley (2007) Testimony on "State-Owned Enterprises: Vehicles of Industrial Policy Implementation", Hearing on the Extent of the Government's Control of China's Economy, and Implications for the United States, the US-China Economic and Security Review Commission, Washington, DC, May 24-25. Available at http://www.uscc.gov/hearings/2007hearings/hr07_05_24_25.php

[11] Beijing has chosen Baosteel, Beijing Shougang, Tangshan Iron and Steel, Anben Steel and Wugang as a focus for industry consolidation activities, with limited success.

[12] ISI Analytics

Figure 3. Firm Share of Chinese Steel Production in 2004 and 2006



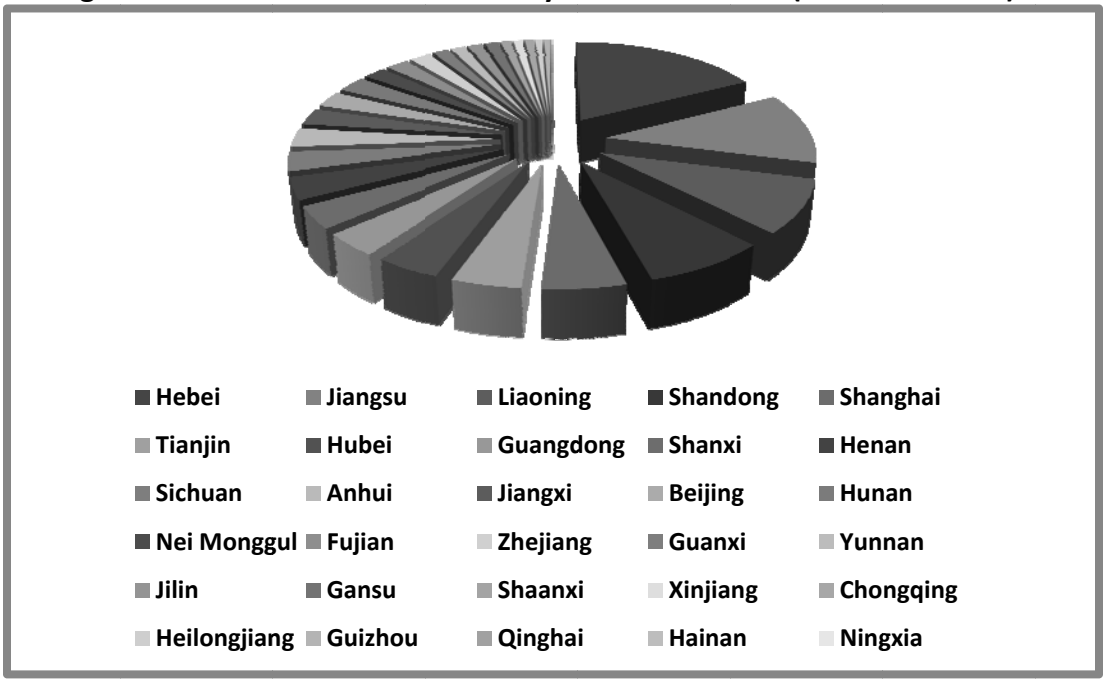
Source: BNP Paribas

The structure of the Chinese steel industry also reflects the Chinese central and provincial governments' ongoing roles. The Chinese steel industry continues as primarily state-owned. Although minority positions in some of the larger producers are privately owned, the Chinese governments hold majority interests in every major Chinese steel producer. Every

province and every region seemingly wants its own steel mill, and local governments are providing lavish benefits to build or to keep their steel industries[13].

Consequently, the Chinese steel industry is also fragmented geographically. While steel production is concentrated in the Northeast, no province accounts for more than 18 percent of China's annual production. Moreover, several provinces have annual production of less than five million metric tons per year. Figure 4 shows annual production of finished steel in China, by province, in 2005[14].

Figure 4. Chinese Steel Production by Province in 2005 (millions of tons)



Source: China Steel Industry Association, CEIC

In 2005, Hebei province ranked highest among China's provinces for steel production. By September 2006, Hebei earned $2.04 billion for the export of iron and steel products, up by

[13] Directorate for Science Technology and Industry Steel Committee (2006), "Current Situation of the Chinese Steel Industry", OECD, Joint India/OECD/IISI Workshop, New Delhi, India, May 16-17, DSTI/SU/SC(2006)9.
[14] China Steel Industry Association, CEIC

46.3 percent from the previous year. The number of profitable steel producers in Hebei province rose by 178 from the corresponding period in 2005 to 904[15].

Supply and Demand

Despite its strategic and political importance, lack of government statistics has obfuscated a systematic understanding of the Chinese steel industry, including trends in domestic supply and demand [16]. Steel demand in China grew at 19.9 percent per annum from 2000 to 2005[17]. Over 50 percent of the steel demand in China comes from long products such as rebar and H-beam, which are primarily used in the property and construction sectors. Conversely, in most industrialized countries, over 50 percent of steel demand comes from flat products such as steel sheets and plates. Steel demand from construction has been slowing down because of the central government's efforts to cool down this overheated sector. The construction sector's steel consumption growth rate declined from 33 percent in 2003 to 9 percent in 2005[18]. Overall, China's population growth rate has also decelerated to 0.6 percent per annum since 2000; the population growth rate is expected to remain stable at 0.6 percent per annum up to 2010. Based on the above assumptions, it can be estimated that steel demand will rise to 512 million tons and 592 million tons in 2007 and 2008, respectively, or demonstrate a 15.7 percent year on year increase. Applying a 15 percent growth rate, China could reach steel consumption per capita of 853 pounds and 981 pounds in 2007 and 2008, respectively. In contrast, the more industrialized countries consume between 550 and 1320 pounds of steel per capita.

[15] ISI Analytics
[16] See T. G. Rawski (2001) "What's Happening to China's GDP Statistics?", China Economic Review, 12 , pp.347-354; and U. C. V. Haley (2003) "Assessing and Controlling Business Risks in China", Journal of International Management, 9, pp. 237-252.
[17] BNP Paribas
[18] World Steel Dynamics Inc.

Although demand has been increasing in China, supply surges from China pose the biggest concern for the global steel industry. The NDRC's estimate of crude steel capacity increases in 2007 range from 10 percent to 15 percent year on year. However, independent research shows that total crude steel capacity in China could reach 499 million tons in 2007, up 19.3 percent year on year[19].

Extensive anecdotal evidence supports the provincial drive behind excess capacity in Chinese steel[20]. Every steel mill wants to increase its size in order to survive. Aside from cost efficiencies and economies of scale, local governments support these expansions for their own benefit: large-scale steel operations can translate to higher employment and tax revenues for local authorities. As a result, while the NDRC's Steel Policy encourages consolidation by phasing out furnaces smaller than 300 cubic meters by 2007 (translating to crude steel capacity of 357,000 tons per annum) a different trend is emerging. Instead of mergers among the steel companies to form larger entities, each small mill is defending its position through organic growth by increasing output. The stated need for the central government's approval does not hinder creeping excess capacity from de-bottlenecking, and this additional capacity can amount to as much as 20 percent of current capacity. In 2007, some small steel producers have suggested that they are adding one to two million tons of crude steel which does not require approval from the central government. The NDRC has extended the deadline for the closure of small plants to 2010.

The larger steel companies such as Baosteel, Wugang and Angang have the central government's unquestioned support for their expansion; but, even the small companies have expressed confidence in their ability to obtain financing – through their connections or through

[19] BNP Paribas

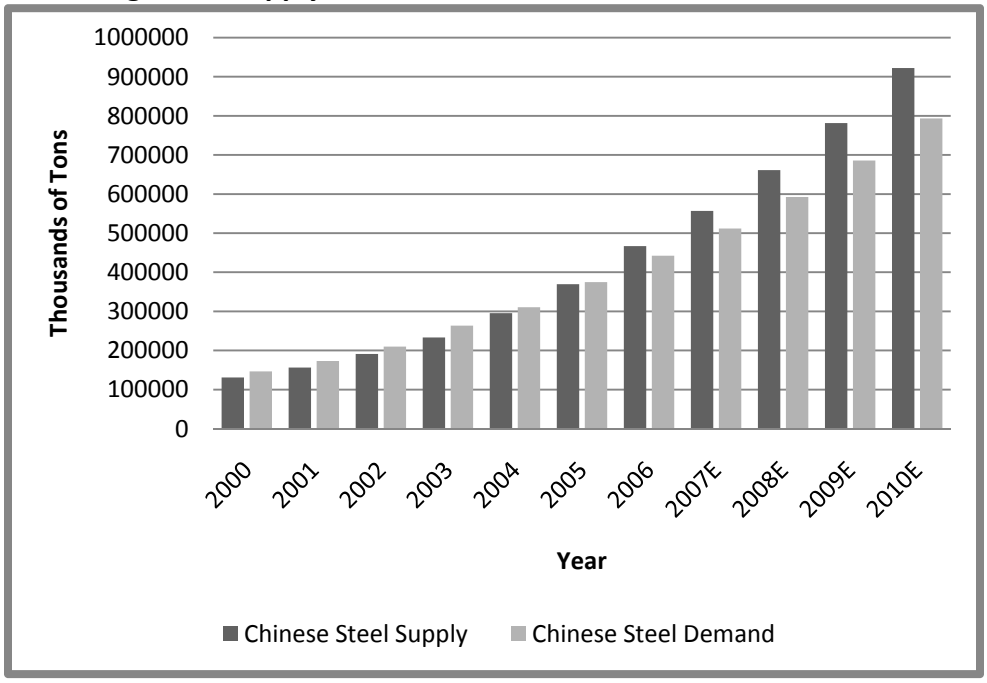
[20] See D. H. Rosen and T. Houser (2007) "China Energy. A Guide for the Perplexed", Peterson Institute for International Economics paper, May.

convertible bonds. For example, in December 2006, Panzhihua New Steel and Vanadium Co. Ltd., a Shenzhen-listed arm of Panzhihua Iron and Steel Group (Pangang), announced it would issue convertible bonds to raise RMB 3.2 billion ($406.63 million) to buy assets from Pangang. Net proceeds from bond placements amounting to RMB 3.107 billion ($394.82 million) were to be used to acquire Pangang's steel and mining assets, including a cold-rolling plant with a 1.3 million ton capacity of cold-rolled plates and galvanized plates a year, and the first phase of Baima iron ore mine, which was scheduled to start operation in December 2006 and to reach designed capacity by 2008[21].

Consequently, rapid growth of steel production has outstripped consumption since the second quarter of 2004, when the central government announced the tightening of measures to control construction activities. The large gap between demand and supply, will lead to even more Chinese steel flooding the world markets. Taking the steel consumption per capita, and the central government's policy measures, and cross-checking these figures with other industrial data and economic indices, the forecasted growth of Chinese steel supply in 2007 is 19.3 percent, compared to 25.0 percent and 26.4 percent in 2005 and 2006, respectively. Figure 5 sketches supply and demand of Chinese steel from 2000 to 2006 and the projected increase from 2007 to 2010. China will be producing more steel than its domestic appetite can digest.

[21] Interfax-China Metals Weekly, 2006

Figure 5. Supply and Demand of Chinese Steel 2000 - 2010



Source: BNP Paribas, author's estimates

Cost Structure

Eighty-seven percent of China's crude-steel capacity comes from blast furnaces (BOF), the highest percentage in the world. The process of making steel influences the choice of raw materials and thereby determines the steel producers' cost structures. The more the steelmakers integrate upstream, the more cost efficient their production. BOF steel production on average has lower costs per ton of crude steel, given its integration with iron ore. The raw materials for BOF steel production (iron ore, coking coal, and thermal coal) form the principal components of steel-manufacturing costs, and represent 50 percent to 70 percent of the cost of goods sold for Chinese steel producers.

The author's research shows that Chinese steel producers' costs are generally 20 to 25 percent lower than those of the American and European producers. Quality differentials

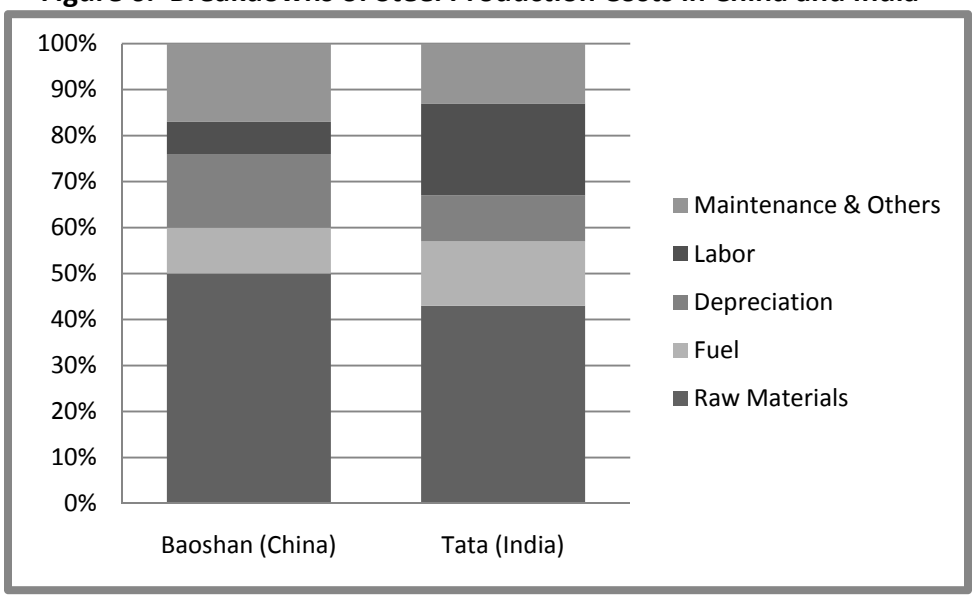
contribute to overall differences in costs as China has focused on low-end steel[22]. However, even if we assume the same quality, factors such as the production process and costs of raw materials and electricity/utilities reduce costs. As the analysis later elaborates, the costs of raw materials and electricity in Chinese steel factories have been significantly reduced through subsidies.

Transportation costs associated with raw materials also affect steel producers' costs, but they vary widely in China. Low-cost producers such as Baosteel are located at harbors, whereas others, such as Wugang, rely on inland transportation to get raw materials from the port to the mills, adding additional costs. Compared with steel mills located inland, plants located by harbors can save about RMB20 to 30 per ton on time and costs associated with inland transportation. Producers with their own fleets also have lower freight costs for imported raw materials such as coking coal and iron ore than those that depend on external ships. For instance, the prevailing rate from to transport coking coal Australia to China is US$16 per ton; but, Baosteel pays only US$6 per ton as shipping takes place on its own vessels [23].

Figure 6 below compares production costs for steel in China and India, another large Asian emerging-market country. For the Chinese steel maker, raw materials form a greater proportion of the cost structure than for the Indian; but, labor and fuel each form a smaller proportion of the costs.

[22] RNCOS
[23] BNP Paribas

Figure 6. Breakdowns of Steel Production Costs in China and India



Source: BNP Paribas, Yuanta Core Pacific Securities, author's estimates

Exports

Previous research has shown a relationship between China's exports and subsidies to SOEs[24]. Other research has shown that a large portion of the subsidies have come from local and provincial governments to enhance regional exports[25].

The surge in exports outlined in Figure 2 has resulted from fragmentation in the steel industry, ramped up production, destocking of steel products and a significant slowing of demand growth[26]. Lower prices for Chinese steel have also served as drivers for exports . The cost structure of the Chinese steel industry, and the US and European companies' strong pricing power have elevated steel prices in the two markets above steel prices in Asia, particularly in China. In 2006, Hot Rolled Coil (3.0mm) was priced at $602 per ton and $633 per ton in the USA

[24] See S. Girma, Y. Gong, H Gorg and Z Yu (2007) "Can Production Subsidies Foster Export Activity? Evidence from Chinese Firm-Level Data", Centre for Economic Policy Research Working Paper Series, No. 6052, January.
[25] See R. S. Eckaus (2006) "China's Exports, Subsidies to State Owned Enterprises and the WTO", China Economic Review, 17, pp. 1-13.
[26] See Macquarie Research (2007) "Steel sector – China continues to Export Aggressively", January 12.

and Europe, respectively, compared to $505 per ton in Asia and $424 per ton in China (excluding value-added tax or VAT). With shipping freight at $60 to $70 per ton, Chinese steel can still sell at an 18.8 percent discount to domestic products in the USA, the largest steel importer[27].

Consequently, US imports of finished steel products from China more than doubled in 2006, increasing from 2.3 million tons in 2005 to 5.35 million tons in 2006. This rate of increase has continued in 2007. In the first half of 2007, US imports increased 23.8 percent over the same period in 2006. China's total finished steel exports surged to 33.8 million tons in the first half of 2007, up nearly 100 percent compared to the same period in 2006[28].

To summarize, under true market conditions, China would undoubtedly have had a large and diverse steel industry, but not one that has grown to account for a staggering 34 percent of total world steel production in three years. The Chinese steel industry in its current form is the creation of the Chinese government. It has benefited from massive direct and indirect subsidies, many of which violate the WTO's Subsidies Agreement, China's obligations under its WTO accession agreement, or both. As described earlier, the Chinese government has also adopted an official policy that requires it to continue to provide the steel industry with massive subsidies.

II. MEASURING ENERGY SUBSIDIES IN CHINA[29]

The WTO has generally defined subsidies as unrequited transfers from governments to enterprises, including direct payments, tax concessions, contingent liabilities and the purchase and provision of goods and services[30]. China defines subsidies more narrowly as unrequited

[27] Mysteel, BNP Paribas, CEIC, US Department of Commerce
[28] United States Department of Commerce, Bureau of Census
[29] The author is indebted to George T. Haley for his help with data collection, analysis and interpretation.
[30] World Trade Organization (2006) "World Trade Report: Exploring the Links Between Subsidies, Trade and the WTO". Available at http://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report06_e.pdf

direct payments from governments to enterprises, including the returning of VAT[31]. This study uses the WTO definition.

Subsidies exist in all industries that the Chinese central and provincial governments consider economically or militarily strategic, including Steel, Energy, Resource Extraction, Computing, Software, R & D, Environmental Services and Conservation, and Autos. The Chinese central and provincial governments have subsidized the growth of the steel and other strategic industries through at least 14 different subsidies[32]. The Chinese governments have also historically supported inefficient firms, such as those in the steel sector, through subsidies[33].

Data

Institutional reasons (including poor infrastructure to gather data) and strategic reasons (such as using data to create an informational black hole to confuse competitors) hinder the collection of high-quality data in China[34]. Researchers and analysts have found energy subsidies particularly difficult to measure because of the problems with the quality of energy statistics as well as the quality of accounting data[35,36]. In China's case, the country's size, its rapidly shifting quasi-market system and the tendency of provincial officials to lie to boost their political

[31] S. Girma et al., *op. cit*.
[32] U. C. V. Haley (2006), *op. cit*.
[33] See S. Claro (2006) "Supporting Inefficient Firms with Capital Subsidies: China and Germany in the 1990s", Journal of Comparative Economics, 34, pp. 377-401.
[34] For a discussion of the informational black hole see G. T. Haley and C. T. Tan (1996), "The Black Hole of South-East Asia: Strategic Decision-Making in an Informational Void", Management Decision, 34, 9, pp. 37-48; and, G. T. Haley, C. T. Tan and U. C. V. Haley (1998) New Asian Emperors: The Overseas Chinese their Strategies and Competitive Advantages, Butterworth-Heinemann, Oxford (updated and to be republished in 2008 by John Wiley & Sons, Singapore and New Jersey).
[35] Wiley Rein, *op. cit*., found no systematic evidence of energy subsidies to the Chinese steel industry, but presented anecdotal evidence of an electricity subsidy to Baosteel.
[36] See F. Birol and J. H. Keppler (1999) "Looking at Energy Subsidies: Getting the Prices Right", Energy Prices and Taxes, 3rd Quarter, for a listing of some of the measurement problems attending the gauging of energy subsidies in China.

fortunes magnify the problems of data quality[37]. Chinese central and provincial governments also covertly and overtly use many policy instruments to reduce industrial costs. For example, analysts from the International Energy Agency (IEA) noted major problems with energy statistics submitted by China, including the substantial discrepancy between coal supply and demand arising from poor data on stock changes. Consequently, the IEA started compiling its own statistics to estimate Chinese coal production based on demand-side statistics[38].

Lack of regular and rigorous surveys also clouds other official statistics on energy. China's official statistics are riddled with inconsistencies. For example, the numbers reported on growth in both GDP and Fixed Investment, as well as between Investment and Savings are incompatible. Services are poorly covered in national-account measures and consumption of all kinds, including industrial consumption, is probably grossly underestimated[39]

Accounting data in China are particularly opaque. Despite Beijing's avowed goal of adopting international accounting standards, certain activities, such as "related-party transactions", are not consistent with international standards, so officials and managers fudge. Under international accounting norms, managers should clearly disclose deals between companies with overlapping ownership. But, because overlapping ownership permeates China, and the government still owns majority shares in every large steel company[40], detailing individual transactions would overwhelm financial reports. Consequently, "pure state-

[37] For a discussion of problems surrounding data collection in China and interpretation of official Chinese statistics see G. T. Haley, U. C. V. Haley, and C. T. Tan (2004) The Chinese Tao of Business: The Logic of Successful Business Strategy, John Wiley & Sons, Hoboken, NJ & Singapore.
[38] International Energy Agency (2007) China and India Insights, World Energy Outlook , Insights Series, OECD, Paris.
[39] See The Economist (2002) "How Cooked are the Books?", March 14; and, The Economist (2006) "Dim Sums", November 2.
[40] See Wiley Rein (2007) *op. cit*.

controlled enterprises" have no disclosure requirements[41]. For this study, many of the steel companies' annual reports did not reveal standard accounting data such as "Bad Debts" and did not define terms such as "Payables to The Government". Cash Inflows from some companies' operations exceeded the Sales reported on the Income statements with no clarification.

Given the monumental problems associated with getting valid and reliable data from China, this study used data from multiple reliable sources across China, the USA, Taiwan, India, and Australia including Chinese government agencies (such as the NDRC), US government agencies (such as the United States International Trade Commission), international agencies (such as the IEA), international investment houses (such as BNP Paribas), and industry associations (such as the American Iron and Steel Institute). Data were also obtained from individual Chinese companies. Data were cross-checked across at least two sources when possible, and when discrepancies arose, the most conservative data were used. Estimates were checked against accounting data provided by individual companies and interviews with managers. Ill-defined data were discarded. For example, the China Iron and Steel Association's (CISA's) Financial Assets Department has recorded subsidies to steel companies and disclosed in publicly-available accounting statements that subsidies to the industry are included in various industry-level calculations. However, the CISA's accounting figures were incompatible across variables. Inquires revealed that the Department officially defines only two terms that it publishes – "Pretax Profit" and "Recovery Rate of Payment". Third parties were not entitled to define the terms that the CISA published. Consequently, the data were not used in the analysis.

[41] For a discussion of research on obtaining valid information in Asia see The Economist (2001) "From Bamboo to Bits and Bytes", April 7, p. 13; and, for a discussion of Chinese accounting see The Economist (2007) "Cultural Revolution", January 11.

In cases of murky data, analysts commonly adopt the price-gap approach to measure subsidies[42]. According to the price-gap approach, subsidies to consumers lower end-user prices and result in higher consumption levels. End-user prices are compared to reference prices to measure the price gap. The reference price represents the efficient price that would prevail in a market undistorted by subsidies and corresponds to the opportunity cost of the last unit consumed. The reference price is usually taken as the border price adjusted for transport and distribution margins and any country-specific taxes in the case of traded goods or the long-run marginal cost of production in the case of goods that are not significantly traded. The approach is designed to capture the net effects of all the different policy instruments that affect a good's price[43]. The price gap can be represented as a dollar value of subsidy per unit of subsidized good or as a percentage of the reference price.

Several issues and assumptions shape the calculation of subsidies. The estimation of the reference price plays a key role in the calculation of the price gap and therefore in the size of the subsidy. Different reference prices can produce very different subsidy estimates. The choice of exchange rate used to compare domestic and international prices also assumes importance. The use of official exchange rates may give very different results from the use of purchasing power parities (PPP) as end-user prices can differ significantly across countries in non-traded goods[44]. Multiple prices in one economy (as exists in China) can also affect the estimation of end-user prices. This study used official exchange rates for the years in question; the reference prices

[42] World Bank (1997) "Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development", Environmentally Sustainable Development Studies and Monograph Series no.17, Washington, DC; and, International Energy Agency (1999) Looking at Energy Subsidies: Getting the Prices Right, World Energy Outlook, Insights Series, OECD, Paris

[43] *Ibid.*

[44] For a discussion of the problems surrounding using PPP to understand China's economy and prices see The Economist (2007) "A Less Fiery Dragon?", November 29.

were industry-specified world prices for thermal coal, coking coal and natural gas as indicated by the international industry associations for steel.

Definition and Measurement of Variables

This study identifies and measures energy subsidies to the steel industry in China, specifically to coking coal, thermal coal, natural gas and electricity. The mathematical equations to calculate subsidies follow:

1. Thermal Coal Subsidies (T_{cs}):

$T_{cs} = \sum_{yr}^{2007} ((WPT_{yr} - CPT_{yr})\, KT_{yr})$, where:

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

WPT_{yr} = World price of thermal coal in each year from 2000 to 2007

CPT_{yr} = Chinese price for thermal coal in each year from 2000 to 2007

KT_{yr} = Kiloton usage in the Chinese steel industry of thermal coal in each year from 2000 to 2007

2. Coking Coal Subsidies (C_{cs}):

$C_{cs} = \sum_{yr}^{2007} ((WPC_{yr} - CPC_{yr})\, KC_{yr})$, where:

C_{cs} = Total subsidies paid to Chinese steel industry for coking coal

WPC_{yr} = World price of coking coal in each year from 2000 to 2007

CPC_{yr} = Chinese price for coking coal in each year from 2000 to 2007

KC_{yr} = Kiloton usage in the Chinese steel industry of coking coal in each year from 2000 to 2007

3. Electricity Coal-Price Increase Subsidy (CPI_s):

$CPI_s = \sum_{yr}^{2007} (S_{yr} (EU_{yr} – SEU_{yr}))$, where:

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

EU_{yr} = Total electricity usage in each year from 2005 to 2007

SEU_{yr} = Percent of electricity usage by Chinese steel industry in each year from 2005 to 2007

S_{yr} = Coal-price-increase subsidy rate in each year from 2005 to 2007

4. Provincial Electricity Subsidies (PE_s):

$PE_s = \sum_{yr}^{2007} (Skwh_{yr} (EU_{yr} \times SEU_{yr}))$, where:

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

EU_{yr} = Total electricity usage of Chinese steel industry in each year from 2000 to 2007

SEU_{yr} = Percent of steel produced by Chinese steel industry in electricity-subsidizing provinces in each year from 2000 to 2007

$Skwh_{yr}$ = Coal-price-increase subsidy rate in each year from 2000 to 2007

And SEU_{yr} is determined by:

$SEU_{yr} = \sum_{yr}^{2007} ((6((TS_{yr} – TSIP_{yr})/22) + TSIP_{yr}) /TS_{yr})$, where[45]:

TS = Total steel production in all 30 Chinese provinces producing steel

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

[45] Six provinces are paying electricity subsidies but have not been specifically identified by the NDRC; 22 steel-producing provinces have not been specifically identified as paying electricity subsidies by the NDRC.

5. Natural-Gas Usage Subsidies (NG_s):

$NG_s = \sum_{yr}^{2007} ((WP_{yr} - CPyr) SG_{yr})$, where:

NG_s = Total natural-gas subsidies paid to steel industry

WP_{yr} = World price of natural gas in year 2000 to 2007

CP_{yr} = Chinese price of natural gas in year 2000 to 2007

SG_{yr} = Natural-gas usage by Chinese steel industry in year 2000 to 2007

III. ENERGY SUBSIDIES TO THE CHINESE STEEL INDUSTRY

In 2007, China has become the world's second-largest consumer of energy. Industry accounts for over 70 percent of final energy consumption in China, while the residential, commercial and transportation sectors account for 10, 2, and 7 percent, respectively[46]. In 2005, the iron and steel industry accounted for 28 percent of total industrial consumption and coal dominated the energy mix [47].

As the preceding sub-section highlighted, despite its importance, researchers and analysts have difficulty deciphering China's energy consumption, and attendant effects on steel. The steel industry's energy consumption fluctuates constantly, and presents a fusion of governmental plans and market forces, formal regulation and seat-of-the-pant remedies, central intentions, and local interests. National security considerations or SOEs' habits of secrecy obscure many key metrics. While the NDRC, the country's top economic planning agency, sets price guidelines, the actual costs and subsidies vary across China since local regulators influence the prices. In a recent white paper, the Information Office of the State Council admitted that "China's energy market system is yet to be completed, as the energy pricing mechanism fails to

[46] CEIC
[47] International Energy Agency (2007) *op. cit.*

fully reflect the scarcity of resources, its supply and demand, and the environmental cost"[48]. Local influences on pricing, dual supply chains for steel companies and arrears can obfuscate assessments of what the steel companies pay for coal, electricity or natural gas.

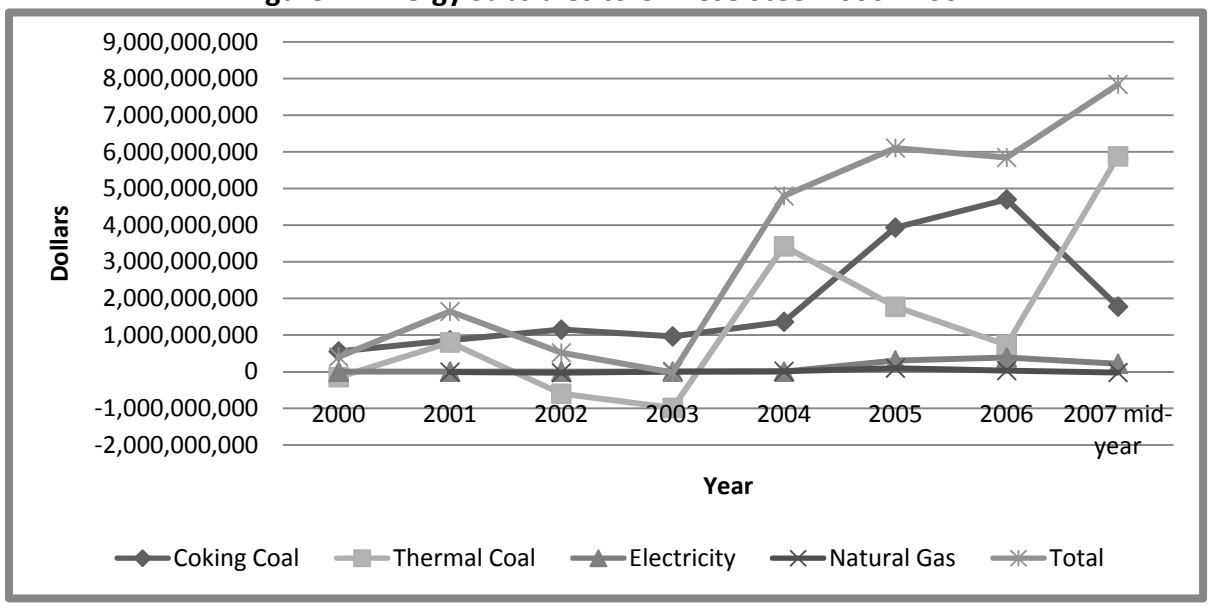
In September 2007, a draft version of China's Energy Law included the suggestion that China establish a unified institution, such as a Ministry of Energy, to supervise the country's energy industry[49]. Currently, multiple ministries and commissions govern China's energy industry, including the NDRC, the State Electricity Regulatory Commission (SERC), the Ministry of Land Resources (MLR) and the Ministry of Commerce (MOFCOM). The Energy Bureau, an NDRC bureau in charge of supervising the energy industry, has a full-time staff of only 100 people; in contrast, the USA's Energy Department has a staff of 110,000[50]. Furthermore, companies such as the China National Petroleum Corporation (CNPC) and the China Petroleum and Chemical Corporation (Sinopec), both of which originally comprised one ministry before being converted to SOEs in the 1980s, still retain the same hierarchical rank as ministries in the government, putting them higher than the bureau that is charged with supervising them. The proposed institution would have a higher rank than these companies. However, experts have argued that the establishment of such a Ministry of Energy would involve the interests of too many parties, leading to potential bureaucratic conflict, and the plan would stall as similar plans have in the past[51].

This research shows that though some subsidies have fallen, total energy subsidies to steel have increased overall and most dramatically since 2004, corresponding to the sharp increase in exports. Figure 7 summarizes subsidies to thermal coal, coking coal, electricity and

[48] Information Office of the State Council of the People's Republic of China (2007) "China's Energy Conditions and Policies", White Paper, December.
[49] Shanghai Securities News
[50] J. Kahn and J. Yardley (2007) "As China Roars, Pollution Reaches Deadly Extremes", New York Times, August 26.
[51] Interfax China Energy Weekly, 2006

natural gas. Using the conservative data and methods outlined in Section III, this study determined that total energy subsidies to Chinese steel from 2000 to mid-year 2007 reached $27.11 billion. Total energy subsidies in 2006 approximated $5.84 billion, and from January through mid-year 2007 reached a recorded high of $7.84 billion[52]. Energy subsidies to Chinese steel since 2002 (immediately following China's WTO entry) through mid-year 2007, approximated $25.07 billion.

Figure 7. Energy Subsidies to Chinese Steel 2000 - 2007



Source: Derived from data provided by International Energy Agency, Steelonthenet, Deutsche Bank, The Standard (January 21, 2006), CEIC, China Statistical Yearbooks, Mysteel, Australian Bureau of Agricultural and Research Economics, Interfax China Energy Weekly, Dragonomics, National Development and Reform Commission

[52] The International Energy Agency (2007) *op. cit.*, estimated that in 2006, total energy consumption subsidies in China (net of taxes) amounted to $11 billion with coal as the most heavily subsidized product. This research synchronizes with those general results.

Subsidies to Coal

Since the 1980s, China has gradually liberalized coal pricing. As with many other Chinese goods , a two-tiered price system emerged, the first set by the NDRC for plan-allocated quotas and the second set by the market for other demand. Over the last two decades, the amount of coal produced for other demand has grown. At the beginning of 2007, the Chinese government abolished the two-tier system and both contract and spot coal must now be negotiated at market rates; however, legacy behaviors linger among the steel companies[53].

China has the world's largest coal market, double the size of the USA's. While down from a post-reform high of 76 percent in 1990, coal still meets over two-thirds of China's energy needs. In 2006, China consumed 2.4 billion tons of coal, nearly twice the amount consumed just six years ago. Over 75 percent of the demand growth in recent years has come from the power sector, as electricity demand boomed and alternative fuel sources (hydro, natural gas, wind, and nuclear) for generating that electricity failed to keep pace. Of the 50 percent of coal not consumed by the power sector, the majority sells directly to industry for use in boilers, coking ovens and on-site ("inside the fence") power generation. Household coal consumption, which accounted for 20 percent of total demand in 1985, dropped to 4 percent as China's residents move into homes equipped with gas and electricity for cooking and heating.

In 2004, the iron and steel industry accounted for around 13 per cent of total coal consumption in China[54].

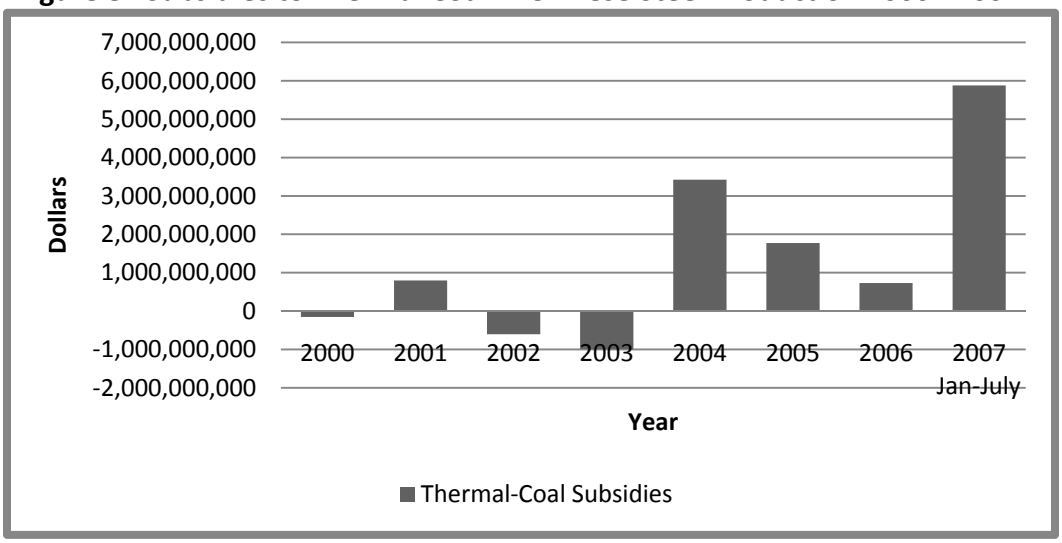
Figure 8 traces the subsidies towards thermal coal received by China's steel industry. Using the data and methods outlined in Section III, this study determined that subsidies for thermal coal to the Chinese steel industry from 2000 to mid-year 2007 reached $11.16 billion.

[53] For discussions of China's coal sector see J. Melanie, R. Curtotti, M. Saunders, K. Schneider, L. Fairhead and Y. Qian (2002) "Global Coal Markets", ABARE Research Report 02.2; and, J. Melanie and A. Austin (2006) "China's Coal Sector. Recent Developments and Implications for Prices", Australian Commodities, 13, 3, September, pp. 542-554.

[54] International Energy Agency (2006) World Energy Outlook, OECD, Paris.

Subsidies to thermal coal in 2006 fell to $731.25 million, as coal prices tended to converge towards market prices. However, from January through mid-year 2007, subsidies to thermal coal rose to an all time high of $5.88 billion as provincial subsidies may have kicked in to bolster steel production. Thermal-coal subsidies to Chinese steel since 2002 (immediately following China's WTO entry) through mid-year 2007, approximated $10.21 billion.

Figure 8. Subsidies to Thermal Coal in Chinese Steel Production 2000 - 2007



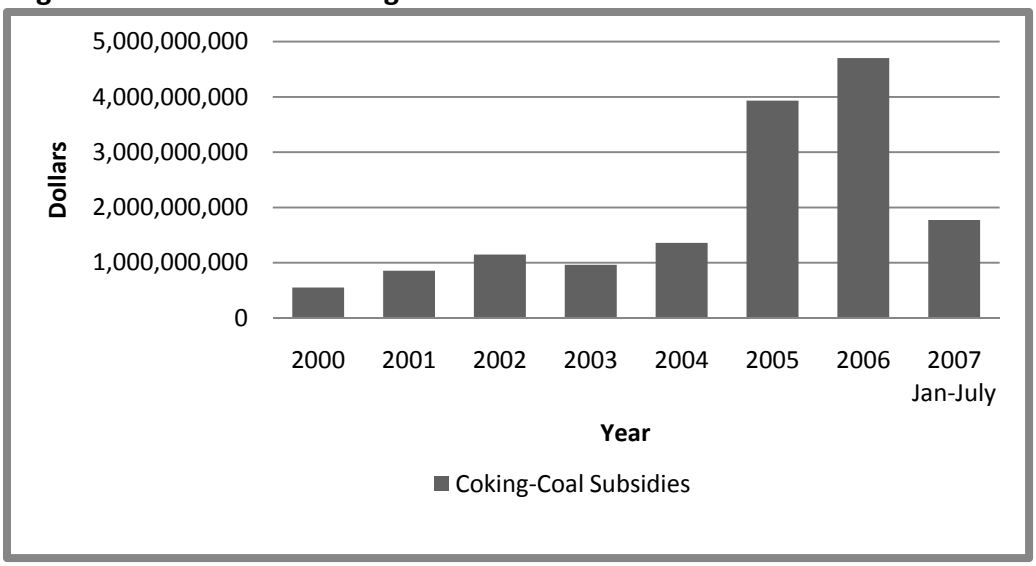
Source: International Energy Agency, Steelonthenet, Deutsche Bank, The Standard (January 21, 2006),

Similarly, coke prices have continued to converge upwards with world prices since 2004, leading to increased provincial subsidies. The Chinese coke industry which supplies about 80 percent of its products to the domestic steel sector has traditionally suffered from fragmentation and overcapacity. At the end of 2005, China had 1480 coke producers and a total production capacity of 300 million tons. Demand stood at 220 million tons in 2005 and capacity exceeded demand by as much as 100 million tons. Yet, new coke facilities capable of producing 30 million tons are being planned across the country. The overcapacity has led in 2007 to

decreases in coke prices[55]. In the first half of 2007, recorded subsides to coke fell to $1.8 billion, substantially down from the same time last year.

Using the data and methods outlined in Section III, this study determined that subsidies for coking coal to the Chinese steel industry from 2000 to mid-year 2007 reached $15.29 billion. Subsidies to coking coal in 2006 reached an all-time high of $4.70 billion and from January through mid-year 2007 fell to $1.77 billion. Coking-coal subsidies to Chinese steel since 2002 (immediately following China's WTO entry) through mid-year 2007, approximated $13.88 billion.

Figure 9. Subsidies to Coking Coal in Chinese Steel Production 2000 - 2007



Source: Steelonthenet, CEIC, International Energy Agency, China Statistical Yearbooks, Mysteel

Subsidies to Electricity

Like the coal used to generate it, industry consumes the majority of the country's electricity, with 10 percent going to iron and steel production. Households account for 11 percent of demand, down slightly from a high of 12.5 percent in 2001[56].

[55] RNCOS, National Bureau of Statistics

Electricity prices for Chinese industry appear high. However, conversations with industry analysts indicate that many steel companies do not bear the full costs indicated by national average figures from the National Statistics Bureau. Subsidies or "price adjustments" permeate the system, and some of these price adjustments occasionally become declassified. The NDRC sets electricity tariffs province-by province based on the recommendations of local pricing bureaus that answer to local officials. Local social and economic concerns often impede the NDRC's efforts to rationalize energy pricing and to reduce overall energy consumption. The Chinese steel industry's energy-intensive firms consume about 20 to 40 percent more energy per ton of output than their competitors in the OECD[57], and are therefore sensitive to electricity-price increases. The provinces that support their inefficient steel companies have resisted the NDRC's recent efforts to raise prices for steel and nonpayment has become an important issue.

The NDRC on April 16, 2007 required 14 provinces to halt immediately their preferential electricity-price policy for local, high-energy-consuming enterprises, in an attempt to curb these industries' development[58]. To restrain high-energy-consuming industries, China had previously introduced in September 2006 differentiated electricity prices for such industries as steel, electrolytic aluminum, ferroalloy, calcium carbide, caustic soda, cement, yellow phosphorus and zinc smelting. The provincial governments failed to implement the policies uniformly. Consequently, the NDRC, together with the SERC ordered locals to rectify their misbehavior by the end of April 2007.

---

[56] CEIC

[57] Y. Wan (2006) "China's Energy Efficiency Policy in Industry", Expert Group Seminar with the OECD Global Forum on Sustainable Development, Paris, March.

[58] Asia Pulse (2007) "China Halts Preferential Pricing of 14 Provinces", April 17.

Yet, provinces continue to subsidize routinely the cost of electricity for steel and metal production. In 2006, when Beijing announced its nationwide campaign to raise electricity prices to energy-consuming industries, officials in the Ningxia province worked to evade the requirements. Fearing the impact on the local economy, the provincial government brokered a special deal for the Qingtongxia Aluminum Group which accounts for 20 percent of the province's industrial consumption and 10 percent of its GDP. Provincial officials removed the company from the national electricity grid and supplied electricity directly to it, exempting it from expensive fees. Consequently, Qingtongxia continued to get its electricity at the lowest price available[59].

Statistics show that some energy-intensive industries have recorded rapid surges in production and profits. Specifically, the steel industry logged year-on-year profit surges of 3.6 times in the first two months of 2007, with crude steel production up 23.1 per cent. In the same period, electricity-generation capacity went up 16.6 per cent, 5.4 percentage points faster than growth in 2006.

Electricity prices overtly remain tightly controlled by the NDRC's Price Bureau. Unlike the developed countries, China has no separately determined transmission tariffs. The NDRC determines both the price at which the generators can sell power to the grid and what the grid can charge different categories of users. The NDRC sets these prices province-by-province in consultation with local price bureaus and tries to accommodate provincial stakeholders' interests. Provincial officials lobby for end-user pricing low enough to keep their industries viable and citizens happy. The power generators lobby for on-grid tariffs high enough to cover their fuel costs and to ensure profits for future investments. And, the grid companies emphasize that they need the margins to finance a $130 billion expansion of China's

[59] H. W. French (2007) "Beijing Seeks Energy Cuts; Localities Find Loopholes", New York Times, November 24.

transmission network between 2006 and 2010[60]. Complex and opaque end-user pricing and transmission costs obfuscate the allocation of rents across the electricity-value chain. Because this study relied solely on published prices and the NDRC's disclosures on provinces that had subsidized their steel industries, the subsidies to electricity are probably underrepresented.

The demand surges over the past three years shrank coal inventories and doubled spot prices. In response, the NDRC enacted a price pass-through mechanism whereby electricity tariffs could be raised by 75 percent of coal-price increases. Yet, electricity prices have only risen by 20 percent on average since the beginning of 2004. The gap between the published national average on-grid price and end-user prices indicate that the grid should make huge profits. However, the reported transmission industry-wide data show meager 2006 profits of 4 percent, up from 1.6 percent in 2004. Further investigation has revealed that the grid can collect less from end-users such as steel companies (either because of reduced rates or nonpayment) than the published rate tables suggest[61].

Reflecting the dominance of coal in China's electricity fuel mix, substantial growth in electricity output has increased demand for thermal coal. Coal consumption by the electricity sector increased at an average annual rate of around 21 per cent between 2002 and 2004 following an increase of 5.6 per cent in 2001. Many coal and power-generation companies have public listings, but considerable government control and ownership remains in both industries. The government is increasingly linking electricity prices with coal costs, and electricity consumption with the introduction of more transparent pricing mechanisms. For example, two-part tariff rates have been introduced to curb electricity consumption by energy-intensive industries and retail electricity charges have also risen recently to reflect higher coal prices[62].

[60] D. H. Rosen and T. Houser (2007) *op. cit.*
[61] *Ibid.*
[62] Australian Bureau of Agricultural and Research Economics

In mid-2004, the price of electricity was increased on average by 0.08 cents per kWh. A further increase of 0.27 cents per kWh was introduced in the east, north, central and southern grids to pass on additional costs of transmission. In 2005, the State Council approved the implementation of a new pricing mechanism to link electricity charges to coal costs. An increase in the coal price is passed on to electricity consumers when the average coal price changes by more than 5 percent over six-months. If the change in the average coal price is less than 5 percent in six months, the percentage price change carries over to the next six months. However, as Table 1 reveals, the central government simultaneously offers a subsidy to the electricity-generation industry, in effect since 2005, to offset the higher electricity prices; this subsidy is then passed on to electricity's customers, including the steel industry[63]. The fuel-input adjustment in 2005, and the attendant increase in subsidy, responded to a significant increase in thermal-coal prices in 2004[64]. In June 2006, electricity charges were increased in response to higher coal costs, additional adjustments for new generation and transmission projects' higher construction costs, and relocation compensation and support for the development of renewable-energy projects. Simultaneously, a subsidy to industry was added to "adjust" for the increased prices.

Using the data and methods outlined in Section III, this study determined that total subsidies for electricity to the Chinese steel industry from 2000 to mid-year 2007 reached $916.39 million. Subsidies to electricity in 2006 reached an all time high of $385.44 million and from January through mid-year 2007 were about $215.88 million. Electricity subsidies to Chinese steel since 2002 (immediately following China's WTO entry) through mid-year 2007, approximated $912.97 million. Figure 10 sketches total recorded energy subsidies (provincial

[63] Interfax China Energy Report Weekly, 2006
[64] Institute of Energy Economics (2006) "China's Electric Power Industry and its Trends", Chun Chun Ni Electric Power, Nuclear Power and Coal Group, Industrial Research Unit, April.

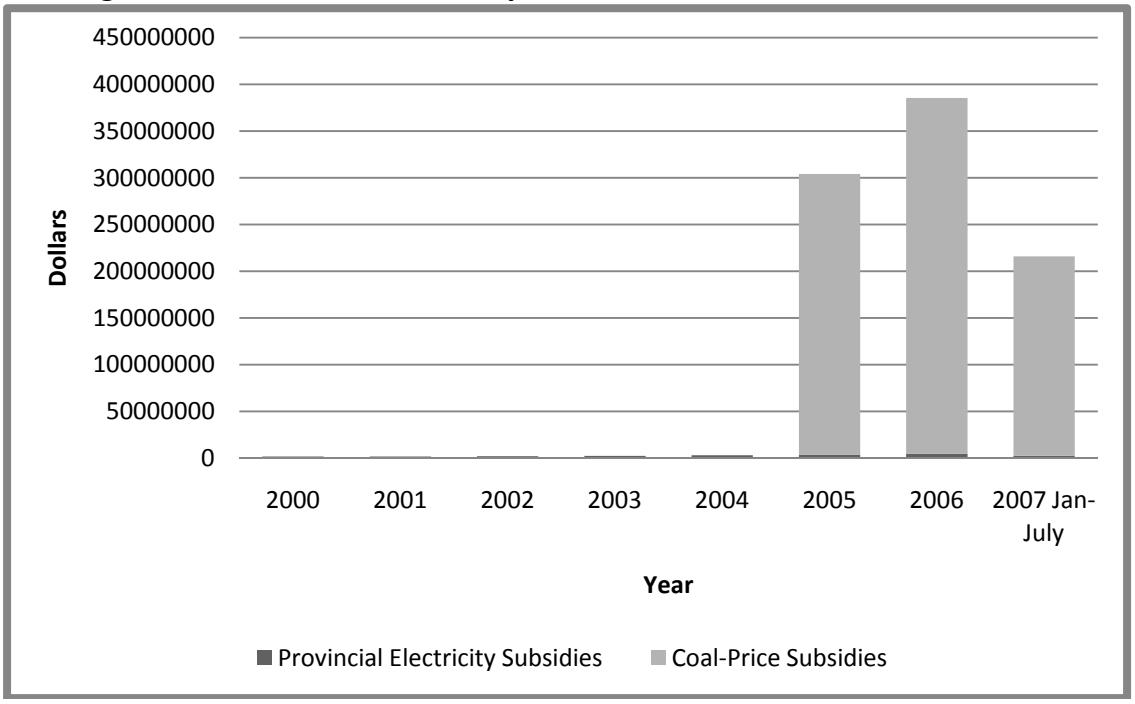
and coal price) to China's steel industry. The coal-price subsidies (to compensate for the increased price of coal) that started in 2005 dwarf the recorded provincial subsidies; Figure 11 records these subsidies from 2000 to 2007. Because of the circumstances described in this sub-section, most of the subsidies to electricity have probably not been uncovered.

Table 1. Some Subsidies to Electricity in China

	Rise in Price USc/kWh
Average Regional Increases in Sales Prices	
Eastern China	0.22
Central China	0.36
Southern China	0.37
Northeastern China	0.17
Average Increase (all regions)	0.30
Subsidies for State Government Projects	
Relocation compensation for new projects)	0.78
Support for the development of renewable energy projects	0.0125
Subsidies for Power Generation Projects	
Compensation for losses caused by the rise in coal cost and transport fees	0.122
Compensation for installation of desulphurization facilities	0.03
Subsidies for Grid Construction	
State power grid construction	0.026
Rural power grid construction	0.007
Subsidies for Local Government Projects	
Subsidies to small hydropower projects, gas fired projects, wind power projects and WEP projects	0.016

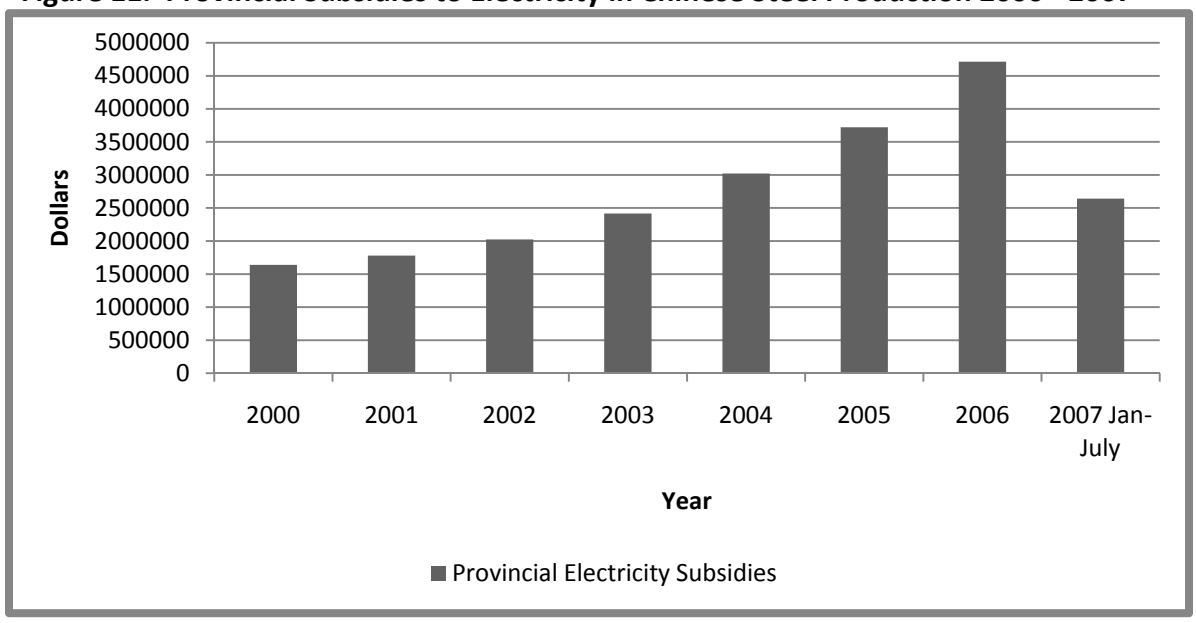
Source: Derived from data provided by Australian Bureau of Agricultural and Research Economics, Interfax China Energy Weekly

Figure 10. Subsidies to Electricity in Chinese Steel Production 2000 - 2007



Source: Australian Bureau of Agricultural and Research Economics, Dragonomics, China Statistical Yearbooks, Interfax China Metals Weekly

Figure 11. Provincial Subsidies to Electricity in Chinese Steel Production 2000 - 2007



Source: Interfax China Metals Weekly, China Statistical Yearbooks, Dragonomics

Subsidies to Natural Gas

China's central government has tightly controlled natural-gas prices and attempted to keep gas prices for industry competitive with other developing countries. But, this approach failed to induce the development or importation of sufficient quantities of natural gas to meet burgeoning demand. Consequently, natural-gas prices have increased. Although Beijing sets natural-gas prices, they vary by province and sector. In most provinces, residential users pay the highest price, followed by chemical producers, power generators, and fertilizer manufacturers[65].

China has a long history of using natural gas. Yet, in 2000, because of underdeveloped gas markets and institutions, and the lack of an integrated, national gas-pipeline network, the share of gas in the fuel mix remained at a low 3.0 percent. The chemicals and fertilizer industries, and the oil and gas sector, served as primary consumers of natural gas. In 2000, only 0.5 percent of electricity generation in China was gas fired.

As the chart from the NDRC below reveals, the Chinese prices of natural gas are based on Cost Plus rather than Net-Back pricing where:

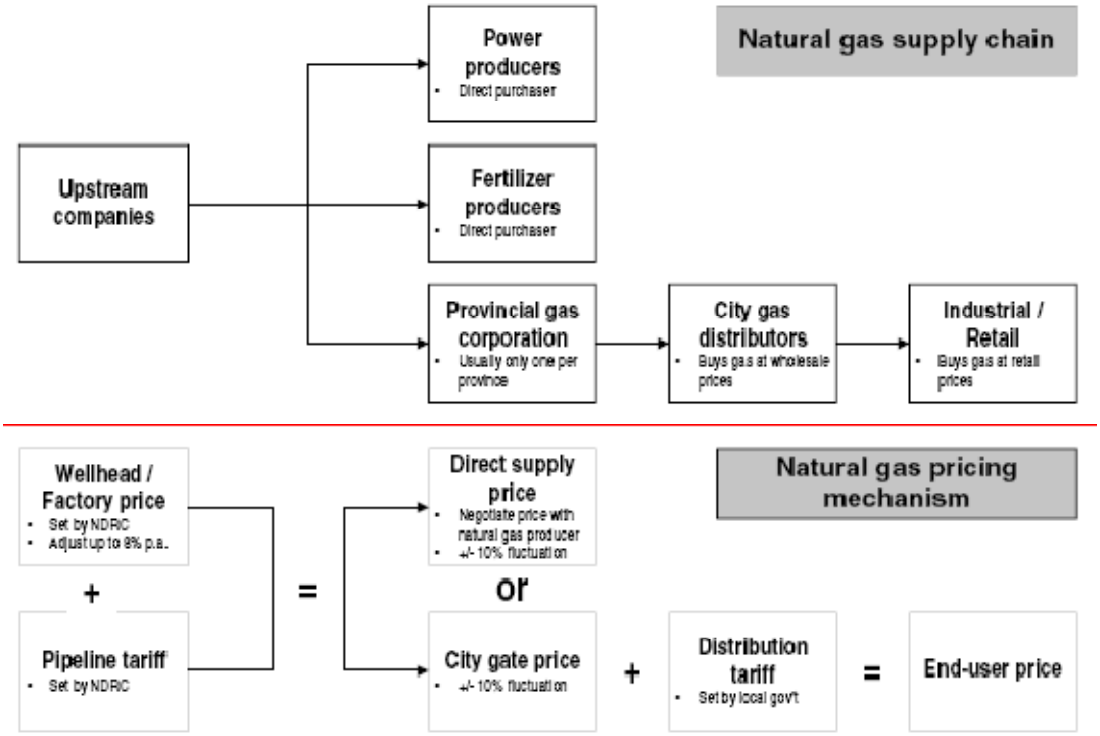
Cost-Plus Pricing = Well-head Regulated Price + Pipeline Mark-up Cost + Local Distribution Mark-up Cost = Sales Price to Consumer

and,

Net-Back Pricing = Market Value of Gas Based on Price of Consumer's Competing Fuel - Distributor Charges – Pipeline Transportation Charges = Net-Back Price at the Well Head[66]

[65] For the role of natural gas see K. Schneider, Q. Ye, R. Curtotti, A. Ball, X. Liu, Z. Wu, S. Gao X. Jiang and Z. Su (2003) "Natural Gas in Eastern China: The Role of LNG", ABARE Research Report 03.1, Canberra, March.
[66] National Development and Reform Commission

Figure 12. Natural Gas Supply Chain and Pricing Mechanisms in China



Source: National Development and Reform Commission through HSBC

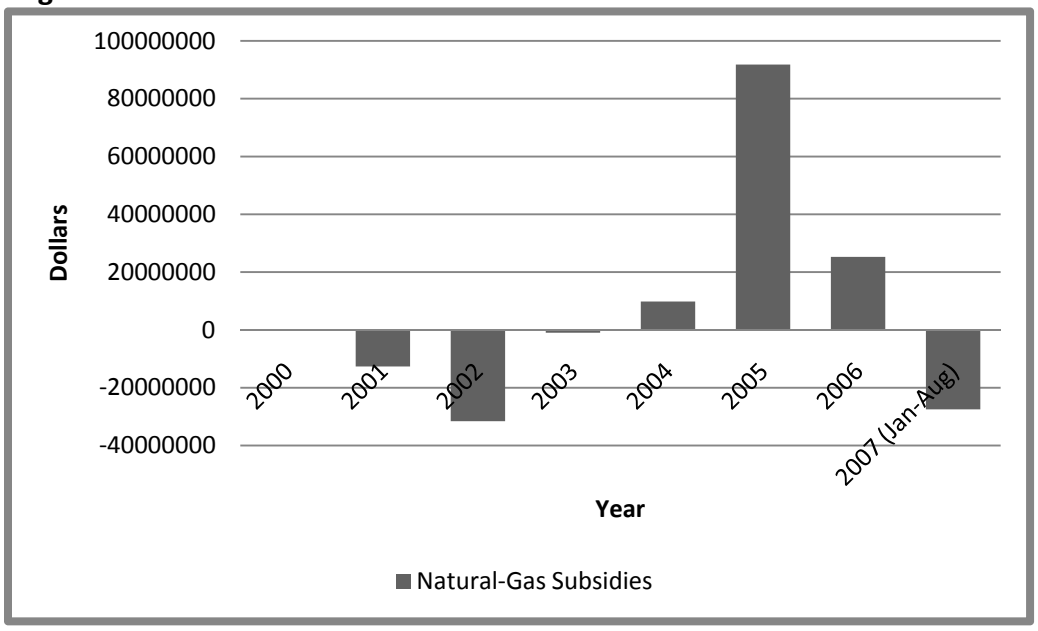
On 22 December 2005, the NDRC announced that it had changed the natural-gas pricing system and would allow a natural-gas price hike of 8 percent per annum[67]. Despite the government proposal of hiking prices by 8 percent a year, it could be the year 2016 before China's domestic-gas prices synchronize with international averages[68]. Due to pricing controls on natural gas, China's well-head gas price trades 60 percent lower on average to international prices, providing a significant subsidy. The EBITDA[69] margin on the domestic wellhead price is 16 percent against the 60 percent of major international benchmarks. These artificially low gas prices reduce the financial burden for end-users, including steel companies.

Despite the low usage of natural gas in the Chinese steel industry's cost structure, the industry benefited in 2005 from the artificially low prices. However, as natural gas prices have

[67] Andrew Yeh, "China Raises Price of Natural Gas", Financial Times, December 27, 2005
[68] HSBC
[69] Earnings before Interest, Taxes, Depreciation and Amortization

risen 8 percent per annum, many of these gains appear to have eroded. Also, a tight gas market creates an incentive for CNPC and Sinopec to supply residential customers at the expense of industry. Several companies have had difficulty ensuring reliable supply at the government-stipulated price. Using the data and methods outlined in Section III, this study determined that subsidies for natural gas to the Chinese steel industry from 2000 to mid-year 2007 reached $54.12 million, but four of these years saw losses of subsidies. Subsidies to natural gas in 2005 reached an all time high of $91.78 million and from January through 2007 mid-year, because of the supply problems, the loss of subsidies amounted to approximately $27.51 million. Natural-gas subsidies to Chinese steel since 2002 (immediately following China's WTO entry) through mid-year 2007, approximated $66.75 million.

Figure 13. Subsidies to Natural Gas in Chinese Steel Production 2000 - 2007



Source: China Statistical Yearbooks, International Energy Agency, CEIC, Steelonthenet

IV. CONCLUSIONS

The research has shown that subsidies have generally declined since 2000, but then shot up sharply in 2004 and later, synchronizing with the buildup in steel capacity in China and the rise in steel exports from China. Preliminary regression analysis outlined in Table 2 shows that *Chinese Energy Subsidies to Steel* has a very strong correlation[70] with both *Chinese Steel Exports Worldwide* as well as *US Imports of Chinese Steel*[71]. Indeed, one can almost perfectly predict *Chinese Steel Exports Worldwide* from *Chinese Energy Subsidies to Steel*.

Table 2. Relationships Between Chinese Energy Subsidies, Chinese Steel Exports Worldwide and US Imports of Chinese Steel

	Pearson Correlation Coefficient	**Significance (1-tailed)**	**N**
Chinese Steel Exports Worldwide with *Chinese Energy Subsidies to Steel*	.959	.000	8
US Imports of Chinese Steel with *Chinese Energy Subsidies to Steel*	.883	.002	8

Source: G. T. Haley and U. C. V. Haley (2007), "Understanding Subsidies to the Chinese Steel Industry from 2000 – 2007: Spotlight on Energy", Industry seminar, United States International Trade Commission, December 5.

The analysis[72] predicts that in any given year,

Chinese Exports of Steel Worldwide (in tons) = 3,192,511.1 + .005 (Chinese Energy Subsidies to Steel)[73]

[70] In this analysis, the Pearson correlation coefficient measures the strength of the linear relationship between the variable *Chinese Energy Subsidies to Steel* and the two variables, *Chinese Steel Exports Worldwide* and *US Imports of Chinese Steel*. A value of 1 indicates that one can perfectly predict the value of one variable from another: the coefficients in the analysis are very close to 1, and highly significant, indicating an almost perfect relation between the variables.

[71] G. T. Haley and U. C. V. Haley (2007), "Understanding Subsidies to the Chinese Steel Industry from 2000 – 2007: Spotlight on Energy", Industry seminar, United States International Trade Commission, December 5.

[72] *Ibid.*

and,

US Imports of Steel from China (in $) = 480,000,000 + .27 (Chinese Energy Subsidies to Steel)[74]

The Chinese central government's policies appear to be aimed at consolidating the steel industry and curbing excess capacity. However, the policies have failed to reduce energy subsidies to steel and are unlikely to do so in the future if recent pronouncements from the steel companies' senior executives provide indicators. For example, on October 26, 2007, Chairman Li Xiawei of Hunan Valin Iron and Steel Group said China will keep exporting steel despite governmental efforts to rein in exports of low-end products[75]. Hunan Valin plans to export between 2.2 million and 2.3 million tons of steel products in 2007, a rise of at least 24 percent from last year, Chairman Li said. Valin Group, China's tenth-largest producer, plans to raise its output by 9 percent to 10.8 million tons in 2007, and it expects revenue to rise 12 percent to about 45.5 billion yuan, Li said. "This year a few dozen million tons were supposed to be shut; if they haven't it creates more pressure for next year. So far, I haven't seen the policies have much effect," he said[76].

What one hand takes away – the other hand gives, and vice versa. The center and provinces differ on policies and goals[77]. The central government's removal of subsidies often results in the provincial government's increasing them. For example, at a State Council conference held on Apr 27, 2007, NDRC's director, Ma Kai, revealed that 10 provinces and municipalities, i.e. Beijing, Hebei, Shanxi, Liaoning, Jiangsu, Zhejiang, Jiangxi, Shandong, Henan, and Xinjiang, had signed a first round of written commitments to shut down and to eliminate outdated iron-making capacity and obsolete steelmaking capacity of 39.86 and 41.67 million

---

[73] *Ibid.*, significant at .000 level
[74] *Ibid.*, significant at .004 level.
[75] "Execs refuse to co-operate", Shanghai Securities News, October 18, 2007.
[76] *Ibid.*
[77] See G. T. Haley, U. C. V. Haley and C. T. Tan (2004), *op. cit.*.for an elaboration of the historical and strategic divergence between the Chinese central and provincial governments' goals and strategies.

tons respectively in the next five years; 22.55 and 24.23 million tons were to be closed down by the end of 2007. Five out of the above-mentioned steelmaking provinces, Hebei, Shanxi, Henan, Jiangsu and Shandong, are responsible for 70 percent of the nation's outdated iron-making capacity and 50 percent of obsolete steelmaking capacity. However, according to the NDRC, some enterprises reconstruct those would-be eliminated facilities and expand production scale to ward off the elimination; some only suspend production and can resume operation at any moment; some sell outdated equipment to other regions; and, some switch iron-making blast furnaces to the production of ductile iron pipes and ferroalloy, which are already severely oversupplied, thereby thwarting the agreements[78].

In conclusion, substantial energy subsidies pervade China's steel production. These subsidies have contributed directly to the ballooning of Chinese steel exports and have affected the global and US steel industries. The Chinese central government's policies on consolidating their steel industry appear to have had limited or no effect on the provinces' subsidies. Future policy initiatives from both the USA and China regarding China's steel exports and compliance with WTO standards may need to accommodate these provincial realities to enhance effectiveness.

[78] *Ibid.*