REPORT OF "THE CHINA PRICE PROJECT"

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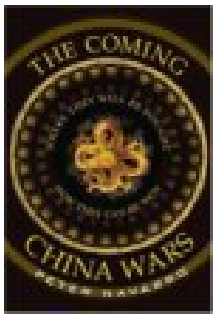

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Abstract

Chinese manufacturers have the capability to significantly undercut prices offered by foreign competitors over a wide range of products. Today, as a result of the "China Price," China has captured over 70% of the world's market share for DVDs and toys, more than half for bikes, cameras, shoes, and telephones; and more than a third for air conditioners, color TVs, computer monitors, luggage, and microwave ovens. It also has established dominant market positions in everything from furniture, refrigerators and washing machines to jeans and underwear.

This article examines the eight major economic drivers of the China Price and provides estimates of their relative contributions to China's manufacturing competitive advantage. Lower labor costs account for 39% of the China Price advantage. A highly efficient form of production known as "industrial network clustering" together with catalytic Foreign Direct Investment add another 16% and 3%, respectively. The remainder of the China Price advantage is driven by more mercantilist elements. Export subsides account for 17% of the advantage, an undervalued currency adds 11%, counterfeiting and piracy contribute 9%, and together, lax environmental and worker health and safety regulatory regimes add another 5%. Implications for management strategy and public policy are noted within the context of the "flight or fight" choice facing manufacturing enterprises seeking to compete with China.

> *"The China Price." They are the three scariest words in U.S. industry. Cut your price at least 30% or lose your customers. Nearly every manufacturer is vulnerable -- from furniture to networking gear. The result: a massive shift in economic power is underway.*
>
> **Business Week**[1]

Chinese manufacturers are able to significantly undercut prices offered by foreign competitors over a wide range of products. Today, as a result of the "China Price," China has captured over 70% of the world's market share for DVDs and toys, more than half of the share for bikes, cameras, shoes, and telephones; and more than a third for air conditioners, color TVs, computer monitors, luggage, and microwave ovens. It also has established dominant market positions in everything from furniture, refrigerators and washing machines to jeans and underwear (yes, boxers and briefs).

Given China's demonstrated ability to conquer one export market after another, an important question for both would-be competitors and world policymakers weighing various protectionist measures is this: How has China been able to emerge as the world's "factory floor"? The answer lies in better understanding the eight major "economic drivers" of the China Price:[2]

1. Low wages
2. Counterfeiting and piracy
3. Minimal worker health & safety regulations
4. Lax environmental regulations & enforcement
5. Export industry subsidies
6. A highly efficient "industrial network clustering"
7. The catalytic role of foreign direct investment (FDI)
8. An undervalued currency

These drivers have been identified from research conducted as part of the "China Price Project" at the Merage School of Business, UC-Irvine (described in the Appendix). This article seeks to derive estimates of the relative contributions of each of these eight drivers to China's competitive advantage. The United States manufacturing sector is used as the benchmark for comparison. The analysis yields several important insights for both policymakers and management strategists.

First, the determination of the China Price extends well beyond issues of cheap labor, currency misalignments, and a lax environmental regime – the "usual suspects" in many trade debates. Second, there are important synergies between many of the China Price drivers. For example, both an undervalued currency and export industry subsidies help attract additional FDI, which in turn, facilities industrial network clustering. Finally, aspects of many of the China Price drivers appear mercantilist, falling outside the norms of international trade agreements (e.g. the WTO) and/or international standards for environmental protection and worker health and safety.

These findings have important implications for companies and their management strategists seeking ways to compete with China and facing decisions about outsourcing and offshoring production activities to China. The findings have equally important

implications for world policymakers (and therefore corporate, environmental, and labor lobbyists) seeking ways to counter the many sharp competitive edges of the China Price and its threat to domestic employment and income and the global environment and labor market.

Data and Methodology

The cost structure of the typical U.S. manufacturing firm is used as the benchmark of comparison. This U.S. cost structure has been developed from multiple sources, including, but not limited to, data from the Annual Survey of Manufactures of the U.S. Census Bureau, the Industry Economic Accounts of the U.S. Bureau of Economic Analysis, the Compustat data base, Blackfriar's Communications for marketing data, Gartner for software expenditures, and Technology Review for data on research and development expenditures. [3] This cost structure is summarized in Exhibit 1, which reports relative costs by the percentage of a dollar of manufacturing output. For example, raw materials represent 46 cents on the U.S. manufacturing dollar, labor costs represent 21 cents, advertising and marketing 9 cents, and so on.

Exhibit 1: The U.S. Manufacturing Cost Structure Dollar

Raw Materials	45.98%
Labor	21.00%
Advertising & Marketing	9.00%
R&D	8.50%
Interest Expenses	3.44%
Transportation	2.90%
Health & Safety	1.60%
Energy	1.53%
Environmental	1.48%
Land & Rent	1.46%
Utilities	1.16%
Software	0.80%

The analysis that follows illustrates how each of the eight economic drivers of the China Price reduce one or more of the components of total cost for Chinese manufacturers. For the six of the eight drivers in the list above, the cost impacts may be directly measured, e.g., lower labor costs in China directly reduce the labor cost component, lower regulatory compliance costs reduce environmental and health and safety costs. However, for two economic drivers in the list -- FDI and the impacts of an undervalued currency -- the cost impacts are of a more indirect or aggregate nature and require a different approach to valuation.

Driver #1: Low Wages for High Quality Work

What is stunning about China is that for the first time we have a huge, poor country that can compete both with very low wages and in high tech. Combine the two, and America has a problem.

Professor Richard Friedman, Harvard University[4]

The available data on wages and compensation in China is scant and of poor quality. Many enterprises regularly underreport data to avoid taxation and payments to social insurance and often keep two sets of books for "management accounts" and "tax accounts."[5] Acknowledging such large variances, this analysis relies on the best available data compiled by Judith Banister (2005),[6] who has calculated an average hourly compensation rate of $0.57.

This rate is not lowest in the world. However, the productivity of Chinese workers is considerably higher than many other lower wage nations. Accordingly, to properly estimate the cost advantage of China's low hourly compensation, it must be adjusted for productivity.[7]

Using supplementary data provided by the U.S. Conference Board, Exhibit 2 compares hourly compensation in the U.S. and China on a productivity-adjusted basis. It illustrates that China's hourly compensation costs are about 1/5th that of the U.S (18%).[8] This suggests that Chinese manufacturers save 17 cents on the manufacturing dollar for labor costs relative to their U.S. competitors.

Exhibit 2: Productivity-adjusted Compensation Rates in China

	Average Hourly Compensation	Productivity Index (US = 100)	Productivity-Adjusted Labor Cost	Adjusted Cost as Percent of U.S.
U.S.	$23.17	100	$23.17	100%
China	$0.57	13.7	$4.16	18%

In most cases, the wage advantage of a developing country should disappear over time, or at least narrow considerably, as it experiences rapid economic growth and labor markets tighten. However, this is unlikely to happen in China, at least for several *decades.*

Short term downward pressure on wages is being exerted by a large "reserve army" of unemployed workers estimated to be anywhere from 100 to 200 million. Many of these workers have been laid off or furloughed (*xiagang*) as a consequence of the privatization of inefficient state-owned enterprises (SOEs). They have become part of a larger "floating population" of migrants. With labor unions banned in China, there likewise has been no emergence of any bargaining power for worker units.

Longer term, the heavier counterweight to rising wages is China's official policy of rapid urbanization to combat chronic rural poverty. The Chinese government seeks to move as many as 500 million peasants off the farm and into China's factories over the

next several decades. To put these numbers in perspective, the combined current work forces of U.S. and Europe number less than 400 million. Thus, despite unprecedented rates of economic growth, wage pressures in China are unlikely to significantly rise soon, making low wages a significant and perennial component of the China Price for decades to come.

Driver #2:Piracy & Counterfeiting

> *China is the epicenter of the counterfeits boom…. Just a few years ago, counterfeiting was all Gucci bags and fake perfume. Now it's everything. It has just exploded. It is many times larger a problem than it was only a few years ago. The counterfeit inventory ranges from cigarette lighters to automobiles to pharmaceutical fakes that can endanger a life. I would bet that there are companies in this country [the U.S.] that don't even know they're getting screwed around the world.*
>
> **Frank Vargo, National Association of Manufacturers**[9]

> *No problem of this size and scope could exist without the direct or indirect involvement of the state. In China, the national government in Beijing appears to be sincere in its recognition of the importance of protecting intellectual-property rights, but national-level authorities are policy and lawmaking bodies, whereas enforcement occurs on the ground at the local level. At this level, local governments are either directly or indirectly involved in supporting the trade in counterfeit goods.*
>
> **Professor Daniel C. K. Chow, Ohio State University**[10]

Piracy refers to the unauthorized production, distribution, or use of a good or service. The goal of a pirate is to create a look-alike "knockoff" that can be sold to a customer as such. *Counterfeiting* involves trying to pass off the pirated products as that of the real, branding corporation. Thus, a golf club that looks like a Callaway driver but has a name like "Hallaway" is a pirated knockoff whereas as knockoff sold as a "Callaway" club is a counterfeit.

The World Customs Organization estimates that counterfeiting accounts for 5% to 7% of global merchandise trade and represents the equivalent in lost sales annually of around $500 billion.[11] Such counterfeiting costs the pharmaceutical industry alone close to $50 billion a year, the auto industry more than $10 billion annually, and the software and entertainment industries billions more.[12]

China is not the only country engaged in this half a trillion dollar trade. Other hotbeds include Russia, India, Vietnam, and South Africa. However, China is considered to be the largest pirate nation; it accounts for an estimated 2/3ds of all the world's pirated and counterfeited goods and 80% of all counterfeit goods seized at U.S. borders.

Despite tough rhetoric from the Chinese government, much of the country's counterfeiting and piracy is state-sanctioned. As noted by numerous scholars, such institutionalized violations of international intellectual property rights laws and treaties create millions of jobs, help to control inflation, and boost the standard of living of hundreds of millions of Chinese consumers. The question for this analysis is what impact might Chinese piracy and counterfeiting have on the China Price. To answer this

question, three of the most important elements of the counterfeiting and piracy cost equation – software piracy, reduced marketing and advertising expenses, and lower capital expenditures on research and development – are examined.

The rate of software piracy in China is well over 90%. This provides substantial savings in both the operating and capital budget portions of the balance sheet for most Chinese enterprises. Based on data published by Gartner, U.S. companies spend, on average, 0.3% of their overall budget on software.[13] Assuming a piracy rate of 90%, this suggests that a China Price savings of a little less than one third of a cent relative to the U.S. manufacturing dollar.

In addition, Chinese counterfeiters need not incur either significant research and development expenditures or substantial advertising and marketing costs to promote their "brand." As noted by A.T. Kearney, "counterfeiting allows skipping the investment necessary to create, develop and market products and go directly to profits. No R&D headaches. No brand building. No advertising."[14]

A study conducted by Blackfriar's Communications of companies of all sizes and across many industries suggests that an average of roughly 9% of revenues are devoted to marketing expenses.[15] To translate this into an effect on the China Price, it is first necessary to assume that some fraction of the Chinese GDP is attributable to counterfeiting and piracy activity. Oded Shenkar (2005) reports estimates that range between 10% and 30%.[16] This suggests that 0.9% to 2.7% of the China Price advantage or a mid-range of 1.8 cents on the manufacturing dollar may be attributed, on average, to the lack of marketing expenses for counterfeit goods.

A similar calculation may be made for industrial R&D. Industries such as autos, biotechnology, semiconductors, and pharmaceuticals are particularly R&D-intensive, with R&D expenditures as a percentage of revenues in the range of 15% or more. More broadly, based on sector-level data reported by *Technology Review*, the weighted average of R&D spending across all sectors of the global economy is estimated to be 8.5%.[17] This suggests that 0.85% to 2.55% may be attributed to the absence of R&D expenditures for counterfeit goods, or a mid-range of 1.7 cents on the manufacturing dollar. That leaves a mid-range total of 3.77 cents on the manufacturing dollar that Chinese manufacturers save because of counterfeiting and piracy.

This is likely to be a conservative estimate. There are also more diffuse cost savings and far more difficult to estimate effects of counterfeiting and piracy not accounted for in these calculations. For example, legitimate companies face warranty costs, which often must be honored even when a counterfeit part leads to failure. Legitimate companies also often incur costs of protecting their own intellectual property. Companies like Nike, Louis Vuitton, Microsoft, and IBM now spend considerable sums on IP protection. They also suffer damage to their good will and reputation when counterfeit products fail (and fail to be recognized as counterfeits).

Driver #3: Minimal worker health & safety regulations

> *Yongkang, in prosperous Zhejiang Providence just south of Shanghai, is the hardware capital of China. Its 7,000 metal-working factories -- all privately owned -- make hinges, hubcaps, pots and pans, power drills, security doors, tool boxes, thermoses, electric razors, headphones, plugs, fans and just about anything else with metallic innards.*
>
> *Yongkang, which means "eternal health" in Chinese, is also the dismemberment capital of China. At least once a day someone... is rushed to one of the dozen clinics that specialize in treating hand, arm and finger injuries, according to local government statistics.... The reality, all over China, is that workplace casualties have become endemic. Nationally, 140,000 people died in work-related accidents last year… according to the State Administration of Work Safety. Hundreds of thousands more were injured.*
>
> **The New York Times**[18]

While the Chinese government instituted new health and safety laws in 1995, few enterprises, either public or private, abide by the laws. There is also very little enforcement by either the central government or local and provincial governments because the goal of economic growth has taken precedence. Nor does any properly functioning legal system exist to protect workers and insure fair compensation for those who are injured so the legal liabilities of Chinese manufacturing enterprises are very limited.

As a result, according even to China's own under-reported statistics, China is one of the most dangerous places to work in the world. The highest risk industries include building materials, chemicals, coal production, machinery manufacture, metallurgy, plastics, and textiles. Diseases ranging from silicosis and brown lung to a variety of cancers caused by the ingestion, inhalation, or contact with toxic chemicals and waste are endemic. Workplace injuries are endemic.

The cost advantages to Chinese manufacturers inherent in this lax health and safety regulatory regime range from the use of cheaper equipment for workers and fewer safety-related expenses to savings on training and safety-related large capital expenditures. For example, Chinese textile companies are unlikely to invest in anti-noise or dust control equipment. Chinese coal mining companies tend to skimp on masks, goggles, and emergency rescue facilities while a wet drilling system costs as much as 60% more than a dry drilling system but significantly reduces hazardous dust emissions.

One way to estimate the cost advantage of China's lack of adequate health and safety regulations is to compare the expenditures on regulatory compliance in the U.S. versus China. A joint study by Mark Crain and Joseph Johnson (2001) estimates these costs in the U.S. to be 1.6% of gross revenues.[19] This suggests that the contribution of lax health and safety standards to the "China Price" may be rather modest (the extreme pain and suffering of Chinese workers notwithstanding). Conservatively, it is estimated

to be 1.07 cents on the manufacturing dollar under the assumption that China spends some fraction, e.g., a third, of what the U.S. spends.

Driver #4: Lax Environmental Regulations & Enforcement

> *China's population is so big and its resources so scarce that if we continue to ignore our environmental problems, that will bring disaster for us and the world.*
>
> **Pan Yue, Deputy Director,**
> **Chinese State Environmental Protection Administration**[20]

China is rapidly become one of the most polluted countries in the world. It is home to 16 of the 20 the world's most polluted cities. Of its almost 100 cities with over a million people each, two-thirds fail to meet World Health Organization air quality standards.

China is also the world leader in the sulfur dioxide emissions and produces the second highest CO_2 emissions. It releases 600 tons of mercury into the air annually, nearly a fourth of the world's non-natural emissions,[21] and it is the world leader in the generation of substances that deplete the world's ozone layer. Acid rain, which severely damages forests, fisheries, and crops, affects one-fourth of China's land and one-third of its agricultural land. As much as 50% of the acid rain in Japan and Korea is of Chinese origin. According to the Chinese Academy on Environmental Planning, more than 400,000 Chinese die prematurely from air pollution related diseases, primarily from lung and heart disease.[22] That number is expected to reach more than 500,000 within a decade.

The statistics on water pollution are equally stark. 70% of China's seven major rivers are severely polluted, and 80% fail to meet standards for fishing.[23] 90% of China's cities and 75% of its lakes suffer from some degree of water pollution,[24] and 700 million Chinese "have access to drinking water of a quality below World Health Organization standards."[25] Liver and stomach cancers related to water pollution are among the leading causes of death in the countryside. [26] All of China's coastal waters are moderately to highly polluted. [27]

Not all of China's air and water pollution can be blamed on its manufacturing industries. Other major sources include pesticide and fertilizer runoff in the agricultural sector and large quantities of human and animal waste that are dumped into waterways or seep into ground water. However, China's industrial sector is the primary contributor of toxic (versus organic) pollution.

The worst polluting industries include paper and pulp, food, chemicals, textiles, tanning, and mining. The most common toxic pollutants include dioxins, solvents, and PCBs, various metals such as mercury, lead, and copper and highly persistent pesticides ranging from chlordane and mirex to DDT.[28]

Many of the polluting factories are small-scale and locally owned. Even when such enterprises are highly unprofitable, they represent important job generators in rural areas plagued by high unemployment. That makes it very difficult for a local environmental protection bureau to either close the polluters down, fine them, or otherwise force them to comply with the pollution control standards.

In addition, in many cases, large factories equipped with the latest and most sophisticated pollution control technologies simply don't use the technologies for fear of driving up production costs. Typically, this is done without any fear of sanctions by lax regulators and often complicit local officials.

While China has some strict environmental laws on the books, the fines that may be levied to enforce the regulations are so insignificant that they are seen merely as a cost of doing business rather than a true deterrent. Local authorities that collect the fines will often recycle the revenues back to the polluters as tax breaks.

A major problem with enforcement is that China's state environmental protection agency is critically understaffed and under-budgeted. While the U. S. EPA employs close to 20,000,[29] China's SEPA has only 300. This is to oversee environmental protection in a country with over a billion people and with close to 100 cities of a million people or more. Finally, as with its weak health and safety regime, China's legal system makes it extremely difficult for pollution victims to properly seek any redress.

China's lax environmental regulations and weak enforcement provide a variety of cost advantages to its industrial sector. Enterprises save money on protective equipment for workers. Many don't have to invest in pollution control technologies while those that do save money by not operating it. Waste disposal costs are considerably reduced.

The impact of these cost advantages on the China Price may be estimated in a similar way to the approach taken with minimal health and safety regulations, i.e., by comparing the costs of environmental regulatory compliance in China versus the U.S. Exhibit 3 compares annual environmental expenses as a percent of gross revenues and costs for two pairs of companies in the relatively high polluting chemical and steel industries in China versus the U.S.[30]

Exhibit 3: A Comparison of Environmental Compliance Costs in the Steel & Chemical Industries

	Environmental Expenses/Revenues
U.S. Steel	2.8%
Bao Steel	0.3%
Dow Chemical	2.7%
Sinopec	0.5%

U.S. Steel reports spending roughly 3% of its revenues on environmental expenses. By comparison, China's Bao Steel spends only about a tenth as much. The figures for Dow Chemical versus China's Sinopec are similar.

More broadly, John Blodgett (1997) provides a summary of pollution control compliance costs in the U.S. that accounts for both capital expenditures and pollution abatement operating costs.[31] As a percent of value added, costs vary widely across industries. They range as high as 17% for petroleum, 9% for pulp mills, and 4% for chemicals to less than one percent for industries such as food, textiles, and printing, with an overall average of 1.48%. This suggests an effect of environmental compliance costs on the China Price very similar to that of lax health and safety regulations of just about one cent on the manufacturing dollar (albeit considerably higher for certain industries).[32]

One final observation may be useful here. This relatively small contribution to the China Price notwithstanding, China's environmental cost advantages at the individual enterprise level are likely being offset in a significant degree by the aggregate social costs. The World Bank estimates that pollution annually costs China between 8% and 12% of its more than $1 trillion GDP in terms of increased medical bills, lost work due to illness, damage to fish and crops, money spent on disaster relief, and so on.[33]

Driver #5: Export Subsidies

> *The subsidization of manufacturing by the Chinese government extends beyond what might be considered normal bounds to even include the acquisition of raw materials. A fellow NAM [National Association of Manufacturers] member in the copper industry tells us that exports of copper and brass scrap to China have increased about 50% a year for several years, driven in large part by a special subsidy of 30% of the VAT tax applied by the Chinese government to imports of scrap. This subsidy is given to the scrap consumer to invest in upgrading facilities. This subsidy amounts to about 7 cents a pound of the copper content in a market where the successful bidder may be determined by a margin of a quarter cent.*
>
> **Al Lubrano, President, Technical Materials, Inc.[34]**

> *China's state-run banks have routinely extended loans to state-owned-enterprises that are not expected to be repaid. And right now, the big four state banks in China are, for all practical purposes, insolvent.*
>
> **US-China Economic and Security Review Commission[35]**

> *Under state control, many Chinese state-owned manufacturers are operating with the benefit of state-sponsored subsidies, including: rent, utilities, raw materials, transportation, and telecommunications services. That is not how we define a level playing field.*
>
> **U.S. Department of Commerce Secretary Donald Evans[36]**

As a condition of entry into the World Trade Organization, the Chinese government promised to eliminate, or greatly scale back, the complex web of subsidies and tax preferences that had benefited export manufacturers in the decade or more preceding the 2002 WTO entry. Because the Chinese government has not been fully transparent about its compliance with this condition, it is difficult to determine the degree to which this condition has been met. Some evidence does, however, suggest some potentially significant non-compliance.

First, energy and water remain heavily subsidized.[37] Many manufacturers likewise benefit from subsidized rent and/or cheap or free land and preferential access to land by local and regional governments. Assuming a subsidy level of one-third of the total costs for these cost components, this would add a modest 1.38 cents to the China Price advantage.[38]

Second, and of potentially more import, China's state-owned banks continue to hold a large portfolio of non-performing loans. These NPLs often have been issued without expectation of repayment. The biggest beneficiaries of this "free money" policy have been struggling state-owned enterprises (SOEs), which are concentrated in heavy industries like steel and petroleum. Because of continued inefficiencies, many of these industries run at a loss. However, the Chinese government is loath to allow them to go bankrupt because of the loss of jobs that would entail. Accordingly, NPLs historically have represented a major lifeline to these enterprises, with the enterprises responsible neither for interest payments on these loans or repayment of principal.

Since entry into the WTO, the Chinese government appears to have attempted to clean up the existing NPL portfolios on the books of state-owned banks. There remains considerable controversy over how successful these efforts have been. On the one hand, the official rate of non-performing loans has fallen significantly in the last several years, from a reported 15% in 2003[39] to 8.6% in 2005.[40] On the other hand, outside observers have estimated that the percentage of NPLs is two to four times higher than the single-digit statistics now being officially reported.[41] In addition, according to a recent IMF study, China's state-owned banks continue to issue new NPLs.[42]

To estimate the effect of NPLs on the China Price, a rate of 15% is conservatively assumed. Under the additional assumption that interest rate payments on debt represent, on average, 3.44% of total costs, [43] this suggests an advantage of 0.52 cents on the manufacturing dollar (with any such advantage heavily skewed towards sectors dominated by China's SOEs) or about one half of one cent.

Third, in what is arguably a significant violation of the WTO, China continues to use an extensive value-added tax rebate system for its export industries.[44] China's "VAT" is imposed over multiple stages of the domestic production and distribution process, generally in the range of 13% to 17%. In some cases, the Chinese government first collects, and then rebates, this tax for exports. In other cases, exporting firms are simply exempted from the tax..[45]

In the cost structure of U.S. manufacturers, value-added represents 35.8% of the current-dollar gross output of the manufacturing sector.[46] Assuming an average VAT rate of 15%, this suggests a tax benefit of 5.4 cents to the China Price dollar.

The analysis yields, then, a total contribution of export subsidies to the China Price of 7.3 cents. As with many of the estimates in this analysis, it is likely to be a conservative estimate as it does not include other possible sources of subsidies such as other forms of tax relief, "government contracts with payments well below costs and privileged use and retention of foreign exchange earned from exports."[47]

Driver #6: Industrial Network Clustering

National and regional economies tend to develop, not in the isolated industries, but in clusters of industries related by buyer-supplier links, common technologies, common channels or common customers. The economies of the Pearl River Delta region are no exceptions. The region has developed a broad range of clusters in garments and textiles, footwear, plastic products, electrical goods, electronics, printing, transportation, logistics, and financial services. The Pearl River Delta region's electronics and electrical cluster is particularly strong and accounts for the vast majority of Chinese production in a wide range of industries….

Regional Powerhouse[48]

Industrial network clustering refers to the practice of locating all or most of the key enterprises in an industry's supply chain in close physical proximity to one another. Examples of such clustering abound and include Detroit as the "motor city" hub for auto and auto parts manufacturing, New York as a financial center, Silicon Valley as a nexus for technology, and so on. What is different about industrial network clustering in China is not just its large scale and broad scope. It is also the emergence of a myriad of "supply chain cities" that focus on a single product or set of products and serve as the focal points for highly localized supply chains.[49]

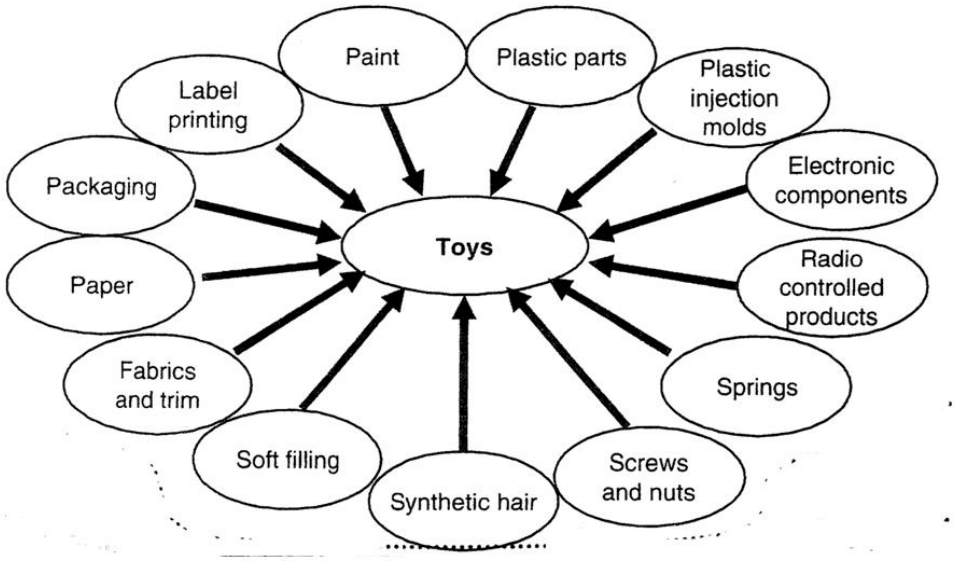
For example, in the Pearl River Delta area of China, the city of Huizou has emerged as the world's largest producer of laser diodes and a leading DVD producer. Foshan and Shunde are major hubs for appliances like washing machines, microwave ovens, and refrigerators. Dongguan's Qingxi Township is one of the largest computer production bases in China. Hongmei focuses on textile- and leather-related products, Leilu on bicycles, Chencun on flowers, Yanbun is the underwear capital, and so on.[50]

This type of localization of industrial focus generates significant production and distribution benefits as it speeds both physical and information flows and extends "just in time" principles to the entire supply chain. In this regard, China's unique form of industrial network clustering is quite different from the "just in time" form of supply chain management that triggered the vaunted Japanese miracle of the last century.

In the Japanese model, the various parts necessary for production arrive from all over the world literally just in time for assembly and manufacturing. Chinese enterprises, often with the synergistic and catalytic help of FDI, have taken this system one level higher by quickly transforming whole cities and towns and tens of thousands of acres of "green field" farmland into industrial production sites. In this model, Chinese manufacturers don't have to rely on an elaborate and globally dispersed supply chain like the Japanese. Instead, many of the various factors of production are located in close proximity to each other in any given industrial network cluster.

Exhibit 4 illustrates the well-known toy cluster in Guangdong Province. Virtually every single factor needed for toy production is produced in very close proximity to the major toy manufacturers. These factors range from packaging, plastic parts, paint, and label printing to springs, screws and nuts, soft filling, and synthetic hair.

Exhibit 4: The Toy Cluster of Guangdong Province



Source: Enright, Scott & Associates Ltd. Research

In terms of direct cost reduction benefits to the China Price, clustering reduces transportation costs by locating factors of production closer to one another. It reduces inventory costs by speeding up throughput times. It reduces "line down time" costs caused by broken links in the supply chain, e.g., a firm lacking a key input is able to secure that input more quickly.

Indirectly, network clustering also generates significant positive information externalities in the form of technology spillovers, knowledge sharing among competitors, and the localized flow of industry information. Firms likewise face reduced search costs while infrastructure costs to both private enterprises and the government are reduced because of the compactness of the supply chain and production grids.

Case analyses of the air conditioner and tannery industries conducted as part of the China Price Project suggest that the direct benefits of network clustering alone lead to a 10% to 16% reduction in fixed and operating costs.[51] Assuming that raw materials represent 46% of the manufacturing dollar,[52] this suggests savings in the range of 5.4 cents to 8.6 cents per manufacturing dollar from the direct cost reduction benefits alone.

Driver #7: The Catalytic Role of Foreign Direct Investment

> *"[A]s capital floods in and modern plants are built in China, efficiencies improve dramatically. The productivity of private industry in China has grown an astounding 17% annually for five years….*
>
> **Business Week**[53]

> *[A] major driver of Chinese productivity gains has been the rapid growth of foreign and foreign-invested firms. These ventures represent foreign direct investment -- long-term investments in the Chinese economy that are directly managed by a foreign entity. Close oversight of these operations by experienced foreign managers provides for the transfer of modern technical and managerial techniques, leading to higher productivity levels. In fact, joint ventures of foreign companies with Chinese firms are seven times as productive as state-owned operations and over four times as productive as domestically run private enterprises.*
>
> **The U.S. Conference Board**[54]

Among developing nations, China has become the leading destination of Foreign Direct Investment (FDI). Since 1983, FDI has grown from less than $1 billion a year to over $60 billion. 72% of China's FDI targets manufacturing.

20% to 30% of China's FDI is estimated to be of domestic origin. It is the result of the "round tripping" of mainland Chinese capital, primarily through Hong Kong (and also the Virgin Islands). This round tripping is driven by the special preferences awarded to FDI in the form of lower tax rates, land use rights and subsidies, administrative support, and other subsidies (most of which represent violations of the WTO) as well as by a desire to evade foreign exchange controls.[55]

Other major FDI participants include the U.S., Japan, Korea, and Taiwan. While the availability of cheap labor and the allure of China's large and largely untapped consumer market certainly play a major role in attracting these participants, lax environmental and health and safety regulatory regimes synergistically factor into the FDI decision. In this regard, multinationals are increasingly being criticized within China for exporting their pollution to the mainland.

In addition, China's undervalued currency also provides considerable FDI synergy. An undervalued yuan makes Chinese assets appear relatively cheap to foreign investors.

China's catalytic FDI provides a variety of competitive benefits. It finances the transfer of the most technologically advanced production and process technologies. It has brought with it managerial best practices and skills as many FDI-financed enterprises are managed by foreign talent. FDI is also often tied to the improvement of both marketing and distribution skills. When all of these attributes are tied to one of the least expensive labor forces in the world, FDI becomes a powerful competitive driver.

While it is relatively straightforward identifying the many benefits of FDI qualitatively, quantifying those benefits regarding the China Price are inherently more difficult and therefore, of all of the China Price drivers analyzed, the analysis is the most

speculative. The approach taken begins with the observation that FDI has played a key role in generating the robust rates of productivity growth observed in China. Various sources place this rate in the range of 8.5% annually since 2000.[56] This compares to a rate of 4.9% in the U.S. manufacturing sector over a similar time period.[57] However, China's rate is also likely to be much higher in industries where FDI has been particularly heavy.

Consider China's textile industry. It has been the largest purchaser of both new shuttle-less looms and spinning equipment in recent years, much of it paid for with FDI. The result is that Chinese textile workers now enjoy similar rates of high productivity as U.S. textile workers.[58]

In labor markets characterized by the lack of surplus labor, productivity gains normally translate into wage increases rather than price reductions. However, in China, there is little evidence other than some minor wage inflation in the coastal areas to suggest that the decreases in production costs from increases in productivity are being offset by rising labor costs. It follows that China's annual productivity gains are providing Chinese enterprises either with the opportunity to lower prices or monetize the productivity gains as increased profits.

Additional evidence suggests that China's productivity gains are likely being translated into price maintenance or price reductions rather than in the distribution of profit. Rates of return on capital are relatively low in China on a risk-adjusted basis.[59] There is also growing surplus capacity in many industries and intense competition among Chinese firms – often all the more intense because of network clustering.

Based on these observations, it is possible to first surmise that some fraction of China's rapid productivity growth is being driven by FDI. This is a finding consistent with the work of Yu Chen and Sylvie DeMurger (2002), who found a clear link between higher rates of productivity and FDI.[60] What is interesting here, however, is that such rapid labor productivity growth alone is unlikely to have a sizeable effect on the China Price precisely because labor costs are so low, e.g., an 8.5% rise in productivity would lower the China Price by less than half a penny on the manufacturing dollar in any given year.

It is highly unlikely, however, that the productivity gains from catalytic FDI are being limited to a single factor of production, i.e., labor. Rather, a more realistic assumption is that FDI has provided a spur to *total factor productivity* growth. That is, in a "KLEMS model framework", FDI allows Chinese manufactures to use all four major factors of production – capital, labor, energy, and raw materials – more efficiently.[61]

Unfortunately, there are no recent estimates of total factor productivity growth in China.[62] More broadly, total factor productivity growth is very difficult to estimate even for highly developed economies such as the U.S. where data is reasonably reliable much less for China, where data is notoriously scant and unreliable.[63]

Under the admittedly highly speculative assumption that the rate of total factor productivity growth is comparable to the rate of labor productivity growth in China, one can postulate a net annual gain in total factor productivity of 3.6% relative to U.S. manufacturers. If one-fourth to one-half of this productivity gain is attributable to FDI, this suggests an annual *recurring* benefit of 0.9 to 1.8 cents on the manufacturing dollar, modest in any one year but arguably quite significant over time as benefits compound.

Driver #8: A Chronically Undervalued Currency

> *China's undervalued currency encourages undervalued Chinese exports to the US and discourages US exports because US exports are artificially overvalued. As a result, undervalued Chinese exports have been highly disruptive to the US and to other countries as well, as evidenced by trade remedy statistics.*
>
> **US-China Economic and Security Review Commission**[64]

Since 1994, China has pegged its currency, the *yuan*, to the U.S. dollar at roughly an 8-to-1 ratio. Under pressure from the U.S. and the international community, China adopted a "managed float" regime in 2005 based on a market basket of currencies. For all practical purposes, however, the dollar peg remains intact; and the *yuan* remains, by most estimates, considerably undervalued. Exhibit 5 provides a representative sample of some of the more credible estimates of the degree of this undervaluation, as well as the estimation methods used.[65]

Exhibit 5: Chinese Yuan Versus U.S. Dollar Undervaluation Estimates[66]

Source	Range	Method
Coudert & Couharde (2005)	44%	Fundamental Equilibrium Exchange Rate (FEER)
Preeg (2002)	40%	Fundamental Equilibrium Exchange Rate (FEER)
Williamson (2003)	Over 25%	Fundamental Equilibrium Exchange Rate (FEER)
Goldstein (2003)	15-25%	Fundamental Equilibrium Exchange Rate (FEER)
Funke & Rahn (2005)	8-12%	Permanent Equilibrium Exchange Rate (PEER)
Yang and Bajeux-Besnainou (2004)	0%	Purchasing Power Parity (PPT)

To calculate the effect of an undervalued currency on the China Price, this analysis will use a mid-range estimate of 20%. In this calculation, a common error is to assign a "one-to-one" correspondence between the degree of undervaluation and the cost advantage to exporters. However, it is critical to also take into account the *import content* of exports. Any benefits from selling exports with an undervalued currency will be at least partially offset by the need to buy from foreigners the raw materials, electronic components, and other imported inputs used in the manufacturing process with that same weak currency.

The import content of most Chinese manufactured goods has been estimated to be quite high, which substantially mutes the currency effect. Lawrence Lau (2003)[67] and William Overholt (2003) suggest that this content is in the range of 75%.[68] Based on this estimate and an assumption of a currency undervaluation of 20%, the contribution of an undervalued currency to the China Price is five cents on the manufacturing dollar. In highly competitive global markets.

Summary, Limitations, and Strategic & Policy Implications

Exhibit 6 provides a summary of the relative contributions by percentage of each of the eight major economic drivers of the China Price using the mid-range estimates developed in the preceding analysis. Given the difficulty of obtaining accurate and reliable data and the need for some simplifying assumptions, these estimates are likely to have a wide margin of error. However, they do provide some important perspective on the *relative* importance of the various sources of competitive advantage in China – as well as the degree to which arguably mercantilist elements of Chinese government policy shape the China Price advantage.

Exhibit 6: Relative Contributions of the Eight China Price Drives

Wages	39.41%
Subsidies	16.71%
Network Clustering	16.02%
Undervalued Currency	11.44%
Counterfeiting & Piracy	8.63%
FDI	3.09%
Health & Safety	2.44%
Environmental	2.26%
TOTAL	100%

Lower labor costs account for 39% of the China Price advantage and clearly represent the dominant driver. On the surface, this would seem to suggest that more than a third of China's competitive edge is driven by a "fair" advantage in a "free trade" environment, i.e., China's comparative advantage in labor resources. However, it is important to note that China's labor advantage is not without its mercantilist elements.

As noted in a petition by the U.S. AFL-CIO to the Office of the U.S. Trade Representative, "workers in China frequently are paid less than the country's minimum wage, denied overtime pay, denied collective bargaining rights and often subjected to abusive treatment."[69] In addition, as previously noted in this analysis, over time, it will be the government's explicit policy of urbanization to combat rural poverty that will depress wages in China for decades to come.

Most of the remaining economic drivers of the China Price are clearly and overtly mercantilist. Export subsides account for 17% of the advantage, an undervalued currency adds 11%, and counterfeiting and piracy contribute 9%. Lax environmental and worker health and safety regulatory regimes add another 5%. Together, these mercantilist drivers account for fully 41% of the China Price advantage.

Left in the gray area of what may constitute unfair trade are network clustering and FDI, which add another 16% and 3%, respectively, to the China Price advantage. In this regard, of all of the eight China Price drivers, the one which foreign competitors can learn the most from in a free trade environment is China's unique form of industrial

network clustering. Put simply, it represents one of the most efficient forms of supply chain management and production ever witnessed.

That said, much of China's industrial network clustering has been fueled by catalytic FDI, which, in turn, is being driven by distinctly mercantilist elements. As previously noted in this analysis, FDI is arriving in China for many reasons other than a legitimate attraction to cheap labor and a desire to gain a foothold in what may soon be the world's largest and most lucrative consumer markets. One major mercantilist aspect of China's FDI magnet is the widespread "round tripping" of domestic Chinese capital to avoid currency controls and gain preferential treatment regarding such elements as taxes, subsidies, and access to land. Other mercantilist aspects include the desire of foreign corporations to manufacture under far laxer environmental and health and safety regulatory regimes.

Future research may wish to focus on developing a more comprehensive data base and refining the methodologies offered in this study. In the meantime, the limitations of this analysis notwithstanding, the picture of Chinese competitiveness that emerges is one heavily dominated by mercantilist elements that clearly violate international trade agreements and/or international standards and norms for everything from intellectual property protection to environmental pollution and worker health and safety. These findings, broad brush though they may be, have important implications for both business strategy and public policy – as well as the interaction between the two in the lobbying arena.

Strategically, non-Chinese enterprises facing the China Price are now being confronted with a classic "fight or flight" decision. The "flight" option is driven by the wide disparity between the China Price and the cost structures of foreign competitors. This option involves what many foreign corporations have been doing, offshoring and outsourcing much of their manufacturing production to China.

From a shareholder point of view, this may well be the right management decision. There are, however, important issues to consider.

First, there is China's increasing political instability. While many people assume that China's highly repressive central government will be able to maintain tight control over an increasingly restive populace, this assumption may prove to be wrong. Political protests in China have been increasing rapidly in both size and number as well as in the violence of the confrontations.[70] The origins of these protests are numerous and varied and include anger over rising income disparities, the forced relocation of the peasantry to make way for private development and public works projects (e.g., the Three Gorges Dam), the severe lack of an adequate, affordable health care system, equally severe environmental degradation, widespread abuses of workers' rights, endemic corruption, and a significant and highly regressive tax burden.

Second, corporations must consider the implications of their own technology transfers to a country in which counterfeiting and piracy are rampant. In many cases, such technology transfers are being forced as a condition of entry into the Chinese market and/or offshoring to China. In other cases, the technology is illegally expropriated. A clear danger is that of the "disposable foreign corporation" as Chinese manufacturers use transferred (or stolen) technologies to move up the development ladder.

Third, the flight option poses serious questions of corporate social responsibility. While low wages and a potentially large consumer market provide legitimate lures for

offshoring production to China, management teams must also ponder whether it is ethical to relocate to China to also avoid more stringent environmental and health and safety regulatory regimes on the home front. This question is all the more pressing because one result of China's current race to the environmental and worker safety bottom is that its manufacturing industries are producing prodigious negative pollution externalities. Such pollution is spilling over China's borders into coastal waters and regional air basins as well as into the global ecosystem, e.g., through phenomena such as the "Asian Brown Cloud" which travels from China along the jet stream to North America.

Fourth, corporations embracing the "flight option" must also consider the welfare of other stakeholders, principally labor and the domestic government. Moving production facilities to China involves a substantial loss of jobs and tax revenues. While corporations benefit in the short run, the longer term implications become less clear as consumers suffer lower per capita incomes and governments are cut off from revenue streams necessary to maintain the domestic standard of living. A lower rate of economic growth in domestic markets over time – and reduced corporate sales and profits – is likely.

The alternative corporate option of "fight" would necessarily entail comprehensive and highly coordinated lobbying efforts across countries aimed at both domestic governments and international agencies. In this option, the goal would be to level the manufacturing playing field with China by pressuring China to adhere to international economic standards of free and fair trade and to "social clauses" that tie trade to international standards for environmental protection and workers' rights and safety.

The preceding analysis suggests a number of proposals that should be high on the lobbying agenda of non-Chinese corporations. These proposals would include meaningful currency reforms, far tougher policies on counterfeiting and piracy, and full compliance with the WTO with respect to export industry subsidies. In addition, corporations may find it necessary to put themselves in what may be the uncomfortable and unfamiliar position of lobbying for more stringent environmental and health and safety standards as part of any international agreements on trade, whether bilateral, within organizations such as the World Trade Organization, or through vehicles such as the General Agreement on Tariffs and Trade.

From a public policy perspective, the implications of this analysis are less clear cut. On the one hand, in a free trade regime, China's comparative advantages in labor costs and industrial network clustering suggest a continued longer term shift to China as the world's factory floor, with all the global redistributive implications that brings. On the other hand, it is clear that a significant portion of the China Price advantage is being driven by mercantilist policies. If American and other manufacturers around the globe are ever going to be able to compete on a level playing field with China, it is all the more crucial that the policymakers around the world take very aggressive policy steps to address China's export subsidies, undervalued currency, counterfeiting and piracy, and the maintenance of lax environmental and worker health and safety regulatory regimes that are far outside the norms of international standards.

There is also the matter of FDI. As noted, while much of it is being drawn to China because of the lure of low cost labor and a potentially large consumer market, it is equally true that many of the FDI magnets represent gross violations of free and fair

trade. This must be squarely addressed both within and outside China. In these efforts, business and government can work hand in glove towards a common goal – free and fair trade and a China Price devoid of mercantilist elements.

APPENDIX: The China Price Project, University of California-Irvine

The China Price Project was conducted at the Merage School of Business from October 2005 to March 2006 as an experiential, multidisciplinary, and integrative class exercise. An initial discovery phase identified the major economic drivers of the China Price. Students then participated in two additional phases. The first phase focused on a detailed team analysis of each of the eight specific economic drivers of the China Price. Industry analyses were conducted in the second phase. The following students made material contributions to the Project findings.

MBA Team Members		Project Phase #1 China Price Component Analyzed	Project Phase #2 Industry Analyzed
Mani	Ahmadi	Counterfeiting & Piracy	Chemicals
Erik	Ahroon	Export Industry Subsidies	Semiconductors
Mélisse	Arikok	Export Industry Subsidies	Toys
Art	Busayajinda	Counterfeiting & Piracy	Toys
Steve	Chang	Low Wages	Semiconductors
Wei	Chang	Export Industry Subsidies	Telecommunications
Dennis	Chen	Counterfeiting & Piracy	Electronics
Vince	Cipresso	Lax Environmental Regulations	Chemicals
Chris	Cook	Export Industry Subsidies	Textiles
Jonathan	Cruz	Industrial Network Clustering	Appliances
Minh	Dang	Counterfeiting & Piracy	Textiles
Micah	Der	Lax Environmental Regulations	Textiles
Tyler	Duell	Export Industry Subsidies	Appliances
Brent	Eickhoff	Lax Worker Health & Safety Standards	Electronics
Sharif	El-Badawi	Lax Worker Health & Safety Standards	Textiles
Emmanuel	Fan	Lax Environmental Regulations	Pharmaceutical
Lawrence	Fan	FDI	Textiles
Ed	Francolin	Export Industry Subsidies	Chemicals
Sepideh	Gazeri	Low Wages	Electronics
Chris	Giles	FDI	Chemicals
Charles	Gutzwiller	Counterfeiting & Piracy	Textiles
Hanh	Hoang	FDI	Telecommunications
Charles	Hong	Lax Environmental Regulations	Appliances
Jane	Hu	Counterfeiting & Piracy	Appliances
Grace	Huang	Low Wages	Pharmaceutical
Grace	Huang	Industrial Network Clustering	Electronics
Pat	Huang	Lax Environmental Regulations	Toys
Brian	Humenesky	Low Wages	Chemicals
Silvie	Hwang	FDI	Appliances
Cosmin	Ibanescu	An Undervalued Currency	Textiles
Alex	Jaksch	Industrial Network Clustering	Chemicals
Kathy	Jalali	Lax Worker Health & Safety Standards	Pharmaceutical
Brig	Jorgensen	Low Wages	Automotive
Kyle	Jung	Lax Environmental Regulations	Textiles
Ahmed	Khatib	An Undervalued Currency	Pharmaceutical
Ju	Kim	Counterfeiting & Piracy	Telecommunications

Michelle	Kincanon	Low Wages	Textiles
Stephanie	Knox	Lax Environmental Regulations	Automotive
Fiona	Kwei	Export Industry Subsidies	Electronics
Jerry	Lee	Lax Worker Health & Safety Standards	Textiles
Sheldon	Li	Counterfeiting & Piracy	Pharmaceutical
Stan	Lim	FDI	Electronics
Meenal	Limaye	FDI	Pharmaceutical
Will	Lu	Counterfeiting & Piracy	Automotive
Angela	Ma	Lax Worker Health & Safety Standards	Automotive
Heather	Miller	An Undervalued Currency	Automotive
Ryan	Mills	FDI	Semiconductors
Albert	Miranda	Low Wages	Toys
Eugene	Moorcroft	Low Wages	Chemicals
Monica	Morita	Lax Worker Health & Safety Standards	Semiconductors
Peter	Nguyen	Industrial Network Clustering	Automotive
Theresa	Nguyen	FDI	Textiles
Gus	Ordonez	An Undervalued Currency	Chemicals
Farooq	Qureshi	Counterfeiting & Piracy	Semiconductors
EJ	Ralston	FDI	Automotive
Abdul	Rastagar	An Undervalued Currency	Textiles
Clayton	Rivest	Lax Environmental Regulations	Semiconductors
Raul	Rohr	Lax Worker Health & Safety Standards	Chemicals
Camille	Seifert	Export Industry Subsidies	Pharmaceutical
Zoran	Selakovic	Industrial Network Clustering	Pharmaceutical
Bill	Shadrick III	An Undervalued Currency	Telecommunications
Payul	Shahpatel	Export Industry Subsidies	Textiles
Tim	Sheehan	An Undervalued Currency	Semiconductors
Harvey	Shieh	FDI	Toys
Roger	Shih	Lax Worker Health & Safety Standards	Pharmaceutical
Iris	Song	Export Industry Subsidies	Appliances
Michael	Sooter	Industrial Network Clustering	Semiconductors
Silvia	Stanciu	Industrial Network Clustering	Toys
Todd	Steinert	Export Industry Subsidies	Automotive
Kyle	Tracy	Industrial Network Clustering	Telecommunications
Ron	Wagner	Low Wages	Telecommunications
Yong	Wang	Lax Worker Health & Safety Standards	Toys
Andy	Wei	Industrial Network Clustering	Textiles
Cathy	Williams	Lax Worker Health & Safety Standards	Telecommunications
Chik	Wong	Lax Environmental Regulations	Telecommunications
Chia-Chieh	Wu	Low Wages	Textiles
Anna	Xie	An Undervalued Currency	Appliances
Evalyn	Yeh	An Undervalued Currency	Toys
Jerry	Yeh	Industrial Network Clustering	Appliances
Adam	Yin	Lax Environmental Regulations	Electronics
Junji	Yoshida	Low Wages	Appliances

ENDNOTES

[1] "The China Price." *Business Week*, December 6, 2004.
[2] These drivers have emerged from research conducted as part of the "China Price Project" at the Merage School of Business, UC-Irvine. The research team, listed in the Appendix, included more than 100 MBA students, including many native Chinese.
[3] The use of multiple data sources poses some problems of addition and comparison and is noted as one of the limitations of the analysis.
[4] "The China Price." *Business Week*, December 6, 2004.
[5] Banister, Judith. "Manufacturing earnings and compensation in China. Monthly Labor Review, August 2005, p. 34
[6] Banister, Judith. "Manufacturing earnings and compensation in China. Monthly Labor Review, August 2005
[7] Adjusting for lower quality would also be appropriate based on a metric such as higher defect rates. However, the data was insufficient to make this adjustment.
[8] Comparative productivity data provided by the U.S. Conference Board for 2002 by email correspondence.
[9] Quoted in "Genuine Problem: Counterfeit products from China Continue to Bedevil Makers of Legitimate Goods. *Journal of Commerce*. June 27, 2005.
[10] Statement of Professor Daniel C. K. Chow, Congressional-Executive Commission on China, May 16, 2005. "Intellectual Property Protection as Economic Policy: Will China Ever Enforce Its IP Laws? http://www.cecc.gov/pages/roundtables/051605/Chow.php testifying before the U.S. Senate committee on Governmental Affairs in April 2004. In Ted Fishman, *China, Inc*. (New York: Scribner, 2005),, page 237
[11] "*Fakes!"* Business Week Online, January 28, 2005. Quoted in http://www.atkearney.com/shared_res/pdf/Staying_Ahead_of_Chinas_Counterfeiters.pdf p. 16.
[12] "*Fakes!"* Business Week Online, January 28, 2005. Quoted in http://www.atkearney.com/shared_res/pdf/Staying_Ahead_of_Chinas_Counterfeiters.pdf p. 16.
[13]Gartner finds that average spending by manufacturing firms on IT was 1.71% of revenues in 2004 and that software expenses constituted 16.2% of the operating budget, p. 43. Similar results were found for the manufacturing of industrial machinery, i.e., 1.76% of revenues and software as 19.2% of the budget. See "Strategic Analysis Report: Gartner 2003 IT Spending and Staffing Survey Results." October 2, 2003. This suggests about a third of penny on the manufacturing dollar is spent, on average, on software. http://computing.arizona.edu/networkmasterplan/117666.pdf

[14] A.T. Kearney, "The Counterfeiting Paradox." Undated. http://www.atkearney.com/shared_res/pdf/Counterfeiting_Paradox.pdf
[15] "Blackfriars Communications, May 16, 2005. Blackfriars Finds Growth and Shifts in U.S. Marketing Spending in 2005." http://www.tekrati.com/research/News.asp?id=5096
[16] Shenkar, Oded. The Chinese Century : The Rising Chinese Economy and Its Impact on the Global Economy, the Balance of Power, and Your Job. Wharton School Publishing, 2004.
[17] "R&D 2005." *Technology Review*. September, 2005.
[18] Kahn, Joseph. "China's Workers Risk Limbs in Export Drive." *The New York Times*, April 7, 2003. http://www.asria.org/ref/library/social/lib/031208_NYTimes_sweatshops_inchina.pdf
[19]Crain, W. Mark, and Johnson, Joseph, "Compliance Costs of Federal Workplace Regulations: Survey Results for U.S. Manufacturers. Regulatory Studies Program. Mercatus Center. George Mason University. Arlington, Virginia. December, 2001. http://www.mercatus.net/pdf/materials/57.pdf
[20] Wonacott, Peter. "Polluters in China Feel No Pain." Wall Street Journal, March 24, 2004
[21] Pottinger, Matt, Stecklow, Steve and Fialka, John J. "Invisible Export – a Hidden Cost of China's Growth: Mercury Migration." *The Wall Street Journal*, December 20, 2004. http://yaleglobal.yale.edu/display.article?id=5058
[22] Jonathan Watts, *The Guardian*, "Satellite Data Reveals Beijing as Air Pollution Capital of World." October 31, 2005.
[23] Zhang, Guang-Xin and Wei, Deng "The Groundwater Crisis and Sustainable Agriculture In Northern China." *Water Engineering & Management* 149(4): 13.April 2002.
[24] "China Says Water Pollution So Severe That Cities Could Lack Safe Supplies." China Daily. June 28, 2005.
[25] Butler, Tina. "China's Imminent Water Crisis." mongabay.com May 30, 2005. http://news.mongabay.com/2005/0531-tina_butler.html
[26] Butler, Tina. "China's Imminent Water Crisis." mongabay.com May 30, 2005. http://news.mongabay.com/2005/0531-tina_butler.html
[27] Xinhua Agency Report. "The Frequency of Offing Red-tide Increasing." http://monkey.ioz.ac.cn/bwg-cciced/english/warnings/warnings.htm
[28] "Toxic Chemicals To Be Phased Out." *China.org.cn* November 11, 2004. http://www.china.org.cn/english/2004/Nov/111804.htm
[29] Democracy in America, "Bureaucracy: A Controversial Necessity." http://www.learner.org/channel/courses/democracyinamerica/dia_8/dia_8_video.html

[30] United States Steel Corporation, Securities and Exchange Commission Form 10-K, for year ending December 31, 2004. Annual Report, 2004. Shanghai Baosteel Group Corporation. 2004 Environmental Report, Baoshan Iron & Steel Co. (Baosteel was formerly known as Baoshan.) Dow Chemical, Securities and Exchange Commission Form 10-K, for year ending December 31, 2004. Annual Report, 2004. Shanghai Baosteel Group Corporation.Sinopec Shanghai Petrochemical Company Limited, Form 20-F, Securities and Exchange Commission, for fiscal year ended December 31, 2004.

[31] Blodgett, John "Environmental Protection: How Much It Costs and Who Pays." Environment and Natural Resources Policy Division, Congressional Research Service, April 16, 1997. Note that this may be the best survey available as it is based on the last annual surveys of pollution control costs conducted by the Bureau of Census and Bureau of Economic Analysis. These surveys were discontinued after reportage of the 1994 data. http://www.ncseonline.org/nle/crsreports/risk/rsk-10.cfm

[32] For a summary of some of the early literature, see U.S. Office of Technology Assessment. 1992. *Trade and the environment: Conflicts and opportunities*. Report no. OTA-BP-ITE-94. Washington, D.C.: Government Printing Office. Appendix E: "Assessing Trade and Competitiveness Impacts of Environmental Regulations on U.S. Manufacturing. http://www.ciesin.org/docs/008-067/appendixe.html

[33] World Bank. Clear Skies, Blue Water: China's Environment in the New Century. Washington, D.C., 1997.

[34] Statement of Al Lubrano President, Technical Materials, Inc. Committee on House Small Business Subcommittee on Tax, Finance and Exports. May 27, 2005.

[35] "The Importance Of Trade Remedies To The Us Trade Relationship With China." *US-China Economic and Security Review Commission*, May 16, 2005, 1.

[36] Remarks by Commerce Secretary Donald L. Evans to the President's Export Council -- American Chamber of Commerce in Beijing, China, June 23, 2004. http://hongkong.usconsulate.gov/uscn/trade/general/doc/2004/062301.htm

[37] China's policy of offering free land use to multinationals has been particularly effective in attracting foreign direct investment.

[38] The sum of energy, land & rent, and utilities in the U.S. manufacturing cost structure is 4.15%.

[39] The China Banking Regulatory Commission announced on January 11, 2004 a rate of non-performing loans of 15.19% in 2003. "Rate of Non-performing loan and remaining amount both decreased." People's Daily. January 13, 2004. http://english.people.com.cn/200401/13/eng20040113_132481.shtml

[40] "China commercial bank NPL ratio falls to 8.6 pct." Xinhua Financial Network News, January 17, 2006.

[41] In a report that it later withdrew under pressure, Ernst and Young reported non-performing loans of $358 billion for China's four big commercial banks and a potential exposure of $911. This was in contrast to the official level of $133 billion. "Ernst & Young Withdraws Nonperforming Loan Report," Australian Associated Press, May 13, 2006. After the Chinese government called the figures "distorted" and "ridiculous," Fitch Ratings subsequently issued a report claiming the level of bad loans to be $220 billion, an amount "close to one-third larger than the stock of capital in the entire banking system." "Fitch estimates China bad loan losses at $220 billion," Xinhua Financial Network News, May 31, 2006.

[42] "China Banks Fail to Cut Bad-loan Risk, IMF Reports." International Herald Tribune, March 31, 2006. Progress in China's Banking Sector Reform: Has Bank Behavior Changed? IMF Working Paper 06/71, by Richard Podpiera, March 1, 2006. http://www.imf.org/external/pubs/ft/wp/2006/wp0671.pdf

[43] The rate was calculated from a sample of 4700 U.S. industrial companies using the Compustat data base.

[44] That this VAT tax rebate system represents In this regard, it is worth noting that the Chinese government has suspended the VAT tax rebate in a number of industries, including most prominently semiconductors. However, it did so only after threats from the U.S. of filing WTO complaints. See, for example, "China Encourages IC Research & Development." China Daily, September 8, 2004

[45] For details, see "China VAT & Export Rebates," Dezan Shira & Associates. **http://www.dezshira.com/china_export_rebates.htm**

[46] Bureau of Economic Analysis, Annual Industry Accounts, September 2005, Manufacturing.

[47] Eckaus, Richard. "China's Exports, Subsidies to State Owned Enterprises and the WTO." China Economic Review 17 (2006: 1-13, p. 5.

[48] Enright, Michael, Scott, Edith and Chang, Ka-Mun. "*The Greater Pearl River Delta and the Rise Of China."* John Wiley & Sons May 27, 2005, p. 57.

[49] See, for example, Kusterbeck, Staci. "China Appeals to U.S. Buyers with 'Supply Chain Cities'." Apparel Magazine, August 20, 2005.

[50] See Enright, Michael, Scott, Edith and Chang, Ka-Mun. Enright, Michael, Scott, Edith and Chang, Ka-Mun. "*The Greater Pearl River Delta and the Rise Of China."* John Wiley & Sons May 27, 2005, for analysis.

[51] See Huang, Qin; Stanciu, Silvia; Yeh, Jerry; and Cruz, Jonathan. "Network Clustering Effect on the China Price." February 8, 2006. See Duell, Tyler; Eickhoff, Brent; Hong, Charles; Hu, Jane; Hwang, SIlvie; Song, Iris; Xie, Anna; Yeh, Jerry, and Yoshida, Junji.

"China Price-Phase II: Appliances-Air Conditioners." March 15, 2006. Unpublished manuscripts online at www.peternavarro.com/chinapriceproject.html.

[52] Bureau of Economic Analysis, Annual Industry Accounts, September 2005.

[53] Engardio, Pete and Roberts, Dexter with Bremner, Brian in Beijing and bureau reports. "The China Price." *BusinessWeek,* December 6, 2004
http://www.businessweek.com/magazine/content/04_49/b3911401.htm

[54] McGuckin, R. H. and M. Spiegelman. "China's Experience with Productivity and Jobs." *The Conference Board* 31 2004
http://www.conference-board.org/publications/describe.cfm?id=809

[55] Numerous studies have examined this phenonmenon. See, for example, World Bank 2002. "Global Development Finance 2002," Washington, D.C. p. 41.

56 The Economic Survey of China, 2005 reports a rate of 8.5% for the year 2003. "Economic Survey of China 2005: Improving the productivity of the business sector.. Organisation for Economic Co-operation and Development." September 16, 200
http://www.oecd.org/document/54/0,2340,en_2649_201185_35350582_1_1_1_1,00.html
The Conference Board reports a rate of 8.7% annually since 2000. "The Conference Board: U.S. Productivity Growth Slowing Sharply, As Emerging Markets Catch Up, The Conference Board Reports" Webbolt Newsroom,
January 19, 2006. http://webbolt.ecnext.com/coms2/news_58545_TRN

[57] U.S. Department of Labor, Bureau of Labor Statistics, Major Sector Productivity and Cost Index. Series PRS30006092, Output per hour, manufacturing.

[58] Kincanon, Michelle; Gutzwiller, Charles; El-Badawi, Sharif; Jung, Kyle; Fan, Lawrence; Cook, Jr., Christopher; Ibanescu, Cosmin; and Wei, Andy. "The China Price: A Look Into the Textile Industry." March 15, 2006. Unpublished manuscript available online at www.peternavarro.com/chinapriceproject.html.

59 As noted in Business Week, "BusinessWeek analysis of Standard & Poor's (MHP) Compustat data on 346 top listed companies in both nations shows Indian corporations have achieved higher returns on equity and invested capital in the past five years in industries from autos to food products. The average Indian company posted a 16.7% return on capital in 2004, vs. 12.8% in China." "A New World Economy: The balance of power will shift to the East as China and India evolve." August 22, 2005.
http://www.businessweek.com/magazine/content/05_34/b3948401.htm

[60] Chen, Yu, and DeMurger, Sylvie. "Foreign Direct Investment and Manufacturing Productivity in China." CEPII Research Project. April 2002.
http://www.bm.ust.hk/~ced/Yu%20CHEN.pdf

[61] For an explanation and application of the KLEMS model framework see Strassner, Erich H., Medeiros, Gabriel W. and Smith, George M. "Annual Industry Accounts:

Introducing KLEMS Input Estimates for 1997-2003. Survey of Current Business, September 2005. 85-9, pp. 31-65. The KLEMS model also includes purchases services.

[62] For an analysis of total factor productivity in China during the period 1988 to 1994, see Chen, Yu, and DeMurger, Sylvie. "Foreign Direct Investment and Manufacturing Productivity in China." CEPII Research Project. April 2002. http://www.bm.ust.hk/~ced/Yu%20CHEN.pdf

[63] For a discussion of the methods used to estimate total factor productivity and the controversies involved, see, for example, Hulten, Charles R. "Total Factor Productivity: A Short Biography," NBER Working Paper 7471, January 2000. http://www.nber.org/papers/W7471.pdf

[64] "The Importance of Trade Remedies to the U.S. Trade Relationship With China." *U.S.-China Economic and Security Review Commission,* May 16, 2005.

[65] Purchasing power parity (PPP) is based on the "law of one price." The Fundamental Equilibrium Exchange Rate (FEER) is based on a comparison of a country's internal and external current and capital account balances. Another frequently used method is the Behavioral Equilibrium Exchange Rate (BEER), which uses the modeling of economic fundamentals like business cycles, productivity growth, and interest rate differentials.

[66] Coudert, V. and Couharde, C. "Real equilibrium exchange rate in China: Is the Renminbi undervalued?" working paper, Centre D'Etudes Perspectives et D'Informations Internationales (CEPII), 2005. Preeg, E. "Exchange Rate Manipulation to Gain an Unfair Competitive Advantage: The Case Against Japan and China," Manufacturers Alliance/MAPI, Oct. 2, 2002. Williamson, J. "The Renminbi Exchange Rate and the Global Monetary System," Institute for International Economics, October 29, 2003. Goldstein, M. "China's Exchange Rate System," Testimony Before the Subcommittee on Domestic and International Monetary Policy, Trade, and Technology Committee on Financial Services. Institute for International Economics. October, 2003. Funke, M. and Rahn, J. "Just How Undervalued is the Chinese Renminbi?" *The World Economy*, 28/4, (2004): 465. Yang, J. and Bajeux-Besnainou, I. "Is the Chinese Currency Undervalued?" Occasional Paper Series, School of Business and Public Management, The George Washington University. GW Center for the Study of Globalization. CSGOP-04-26. February 10, 2004.

[67] Statement of Lawrence J. Lau, "Is China Playing By the Rules?" Congressional-Executive Commission on China, September 24, 2003. http://www.cecc.gov/pages/hearings/092403/index.php

[68] Overholt, William. "Exposing the Myths," South China Morning Post, November 17, 2003.

[69] "Unions Urge Sanctions in China Labor Case," *The Wall Street Journal,* June 9, 2006.

[70] Buckley, Chris. "China To 'Strike Hard' Against Rising Unrest." *Reuters*, January 26, 2006. http://www.howardwfrench.com/archives/2006/01/27/china_to_strike_hard_against_rising_unrest/ Watts, Jonathan. "China Activists 'Vanish Amid Protests." *The Guardian*, February 25, 2006. http://www.guardian.co.uk/china/story/0,,1717604,00.html