Does China Underprice Its Oil Consumption?

By

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Abstract

From 1996 to 2006, China's oil consumption growth far exceeded that of all major consuming countries. China's average growth in oil consumption over the time period 2000 to 2006 was estimated to be approximately 8 percent per year, up from 6 percent per year from 1996 to 2000. One factor alleged to have caused this rapid increase in the growth of oil consumption in China is the under-pricing of oil to domestic consumers--selling oil-derived products such as gasoline and diesel fuel domestically at prices that are less than the world oil price plus the cost of producing that product. We explore validity of this claim, quantify the extent to which oil domestic oil consumption is subsidized by the Chinese government, and assess the impact of these subsidies on China's demand for oil. We find economically significant evidence of under-pricing of gasoline and diesel fuel by China relative to the US over our sample period of January 2005 to July 2008 for all of the approaches to computing the comparable price of these products for the two countries. We estimate that underpricing of oil in the form of gasoline and diesel fuel in China resulted in a total subsidy to Chinese consumers of between 5 and 15 billion dollars in 2007. We also analyze the likely change in the consumption of gasoline and diesel in 2007 that would result from the elimination of this underpricing and find that it had little impact on gasoline and diesel fuel consumption for short-run own-price elasticities in the range of recent estimates of these magnitudes from cross country studies.

1. Introduction

From 1996 to 2006, China's oil consumption growth far exceeded that of all major consuming countries. The Wall Street Journal estimates that China's average growth in oil consumption over the time period 2000 to 2006 was approximately 8 percent per year, up from 6 percent per year from 1996 to 2000.[1] India, its closest rival, had an average annual growth rate in oil consumption of 5 percent from 2000 to 2006 and a 2 percent average annual growth rate from 1996 to 2000.[2] One factor alleged to have caused this rapid increase in the growth of oil consumption in China is the under-pricing of oil to domestic consumers--selling oil-derived products such as gasoline and diesel fuel domestically at prices that are less than the world oil price plus the cost of producing that product. The purpose of this paper is to explore validity of this claim, quantify the extent to which oil domestic oil consumption is subsidized by the Chinese government, and assess the impact of these subsidies on China's demand for oil.

We compute estimates of extent of under-pricing of oil by comparing the prices of major oil-consuming products sold to retail consumers in China to the retail prices of these products in the United States (US) over the time period January 2005 to July 2008 using various transformations of the US prices to make them directly comparable to dollar-denominated Chinese prices. To control for the impact of the fluctuations in the US dollar to Chinese Yuan exchange rate, we also perform this analysis for these same two products sold in France where relative price in China versus France depends on the Euro to Chinese Yuan exchange rate.

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[1] See http://online.wsj.com/public/resources/documents/infoflash07.html?project=oil100_0711&h=530&w=980&hasAd=true&settings=false accessed on October 8, 2008.

[2] See http://online.wsj.com/public/resources/documents/infoflash07.html?project=oil100_0711&h=530&w=980&hasAd=true&settings=false accessed on October 8, 2008.

We find economically significant evidence of under-pricing of gasoline and diesel fuel by China relative to the US over our sample period for all of the approaches to computing the comparable price of these products for the two countries. We very find similar under-pricing results for China relative to pricing in France, so our results do not appear to be due to idiosyncrasies in the US gasoline and diesel fuel industries or the behavior of the US dollar to Chinese Yuan exchange rate. We estimate that underpricing of oil in the form of gasoline and diesel fuel in China resulted in a total subsidy to Chinese consumers of between 5 and 15 billion dollars in 2007.

We also analyze the likely change in the consumption of gasoline and diesel in 2007 that would result from the elimination of this underpricing and find that it had little impact on gasoline and diesel fuel consumption for short-run own-price elasticities in the range of recent estimates of these magnitudes from cross country studies.

The remainder of the paper proceeds as follows. The next section discusses our understanding of how gasoline and diesel prices are set in China. Section 3 describes the gasoline price data used in our analysis and the various transformations we apply to it before undertaking our analysis. Section 4 repeats these same steps for the diesel fuel price data. Section 5 reports on the results of our analysis of the extent of underpricing. Section 6 assesses how much oil demand in China would change if it were eliminated. Section 7 concludes.

2. Gasoline and Diesel Pricing in China

The major oil-using products sold in China are gasoline, diesel, and kerosene. Roughly 29% of oil consumed in China is used produce gasoline and 65% of the oil consumed in China is used to produce diesel fuel[3]. In 2007, 54% of the oil consumed in China came from domestic

[3] See http://xmecc.smexm.gov.cn/2008-2/200821145245.htm, accessed on October 8, 2008

sources. More than 70% of the domestically oil is transported by pipelines to the major refineries[4].

The Chinese Government does not regulate the price for oil but the existence of two large government-owned vertically-integrated oil companies with substantial existing oil wells in and outside of China, allows the Chinese government to set the price of these two major oil-based products below the marginal cost of the highest cost unit produced of each of product. Specifically, the average price paid for the oil used by the refineries owned by each of these vertically-integrated firms is an average of the current world oil price, the cost of producing oil from the firm's existing wells, and contract price for long-term supply purchases from foreign and domestic oil producers.

Because diesel fuel consumption is larger than gasoline consumption in China and the typical refinery produces approximately twice as many gallons of gasoline as gallons of diesel fuel per barrel of oil, China is a net exporter of gasoline. For example, in 2007 China exported 7.4% of its total domestic gasoline production.

China Petroleum & Chemical Corporation is the largest refiner in China. It accounted for more than 40 percent of Chinese gasoline production in 2005[5]. The oil sector in China is heavily controlled by the government. The Chinese government owns the majority shares of China Petroleum & Chemical Corporation (Sinopec) and China National Petroleum Corporation (PetroChina), the two largest refineries and retailers. Sinopec serves slightly less than 70% of the retail market and owns 51% of national refinery capacity, while PetroChina serves slightly more

[4] See http://knowledge.ocn.com.cn/Information/2008811429.html, accessed October 8, 2008

[5] See http://news.xinhuanet.com/fortune/2006-05/25/content_4597183.htm, accessed October 8, 2008

than 30% of the retail market and owns 36% of the national refinery capacity[6]. There is no significant wholesale energy trading sector in China at this point of time.

The National Development and Reform Commission (NDRC), a macroeconomic planning agency that studies and formulates policies for economic and social development also oversees the gasoline and diesel fuel sectors[7]. The NDRC sets the base gasoline and diesel retail prices in all provinces and a certain number of cities as well as the prices of gasoline and diesel for other uses such as that by the military. Retailers then can set the price they would like to sell at within range that is 8% higher or lower than the base retail price set by the NDRC.[8] This retail price also includes a small sales tax, 0.2 yuan/Liter for gasoline, which is around 9-11 cent/gallon, and 0.1 yuan/liter for diesel, which is around 4-5 cent/gallon.[9] During our sample period, NDRC adjusted the gasoline price 9 times in Beijing. This is shown in Figure 1.

Within 48 hours after the NDRC announces an adjustment of the base retail prices, Sinopec and PetroChina are required to reset their retail prices according to the change in the base prices and announce them to the public. This mechanism implies that retail prices change by substantial amounts when NDRC decides to change the base price, but slight changes within the 8% band up or down can happen at the discretion of individual retailers.

It is estimated that Sinopec and PetroChina pay a significant amount of their revenues to the Chinese government as a tax. Sinopec paid approximately 200 billion yuan in 2003-2005.[10] Exploration for oil, oil refining, and retail sales of gasoline and diesel fuel are the main lines of

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[6] See http://news.xinhuanet.com/fortune/2007-11/19/content_7102782_1.htm, accessed October 8, 2008

[7] See http://en.ndrc.gov.cn/brief/default.htm, accessed October 8,2008

[8] See http://www.jgsc.gov.cn/2008-6/2008623800043.htm, accessed July 30, 2008

[9] See http://finance.sina.com.cn/money/lcjyzsw/20050907/08531949449.shtml, accessed July 30, 2008

[10] See http://news.xinhuanet.com/fortune/2006-12/26/content_5535431.htm, accessed July 30, 2008

business for Sinopec and PetroChina. Because production from existing wells and long-term supply contracts at current world prices of oil can yield substantial revenues in excess of production costs for these companies, the Chinese government launched a "special oil tax" in March of 2006. The special tax is assessed if price of oil sold is higher than $40 dollars per barrel ($/bbl).

The oil tax in China is a progressive tax on the world price of oil, with a different tax rate on different ranges of the price: for the part of 40 $/bbl to 45 $/bbl, the rate is 20%; for the part of 45 $/bbl to 50 $/bbl, the rate is 25%; for the part of 50 $/bbl to 55 $/bbl, the rate is 30%; for the part of 55 $/bbl to 60 $/bbl, the rate is 35%; for the part of 60 $/bbl to the actual price, the tax is 40%[11]. This tax is a substantial component of the total tax collected from Sinopec and PetroChina described above.

Because the retail prices of gasoline and diesel fuel are set by NDRC, the Chinese government sometimes gives subsidies to the refineries to purchase oil at world market prices; for example, Sinopec received 5 billion yuan in 2006 from the government.[12] These subsidies compensate for the under-pricing of retail gasoline, diesel and other oil products. Because the Chinese government directly sets the price for the oil products sold to the military and the national reserve, and indirectly sets the retail price through the level of the base retail price, sometimes the refineries have to sell the gasoline and diesel at a price lower that is lower than the marginal cost of the highest cost unit produced.

This pattern of taxation and subsidies indicates that Sinopec and PetroChina earn substantial revenues in excess of their operating costs from sales of petroleum resources, while

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[11] See http://finance.sina.com.cn/money/lcjyzsw/20060404/02322471126.shtml, accessed October 8, 2008.

[12] See http://news.xinhuanet.com/fortune/2006-12/26/content_5535419.htm, accessed October 8, 2008

they lose money from refining and retailing because of the retail prices for gasoline and diesel fuel are set by NDRC.

There does not appear be significant competition in gasoline and diesel fuel retailing in China. During our sample period, the margin between the base price and retail price in most populated regions is typically equal to 8 percent above the base price set by NDRC, as illustrated in Figure 2 for the case of Bejing. Especially in the large cities, gasoline retailing in China is a duopoly between Sinopec and PetroChina, because an independent retailer that would like to enter these markets is unlikely to be able to obtain a reliable source of gasoline given the dominant position of these two companies in the refining sector. In small villages, there are some private gas stations supported by small refineries, which have about 13% of the national refinery capacity.

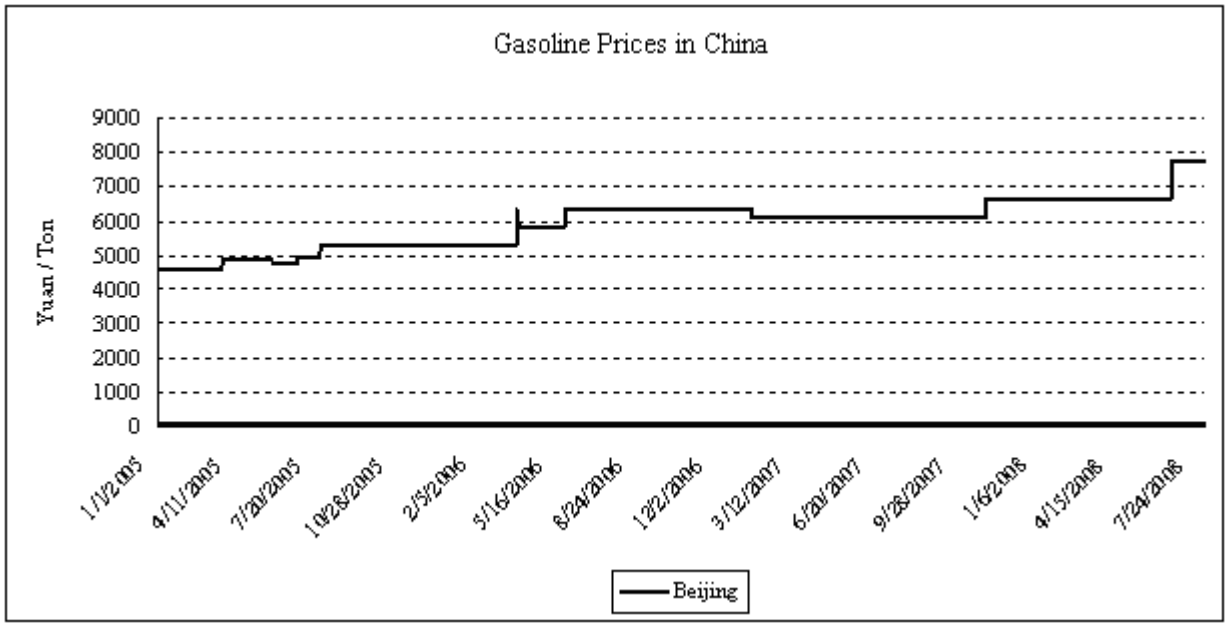

Figure 1, Beijing Gasoline Prices (Yuan /Ton)

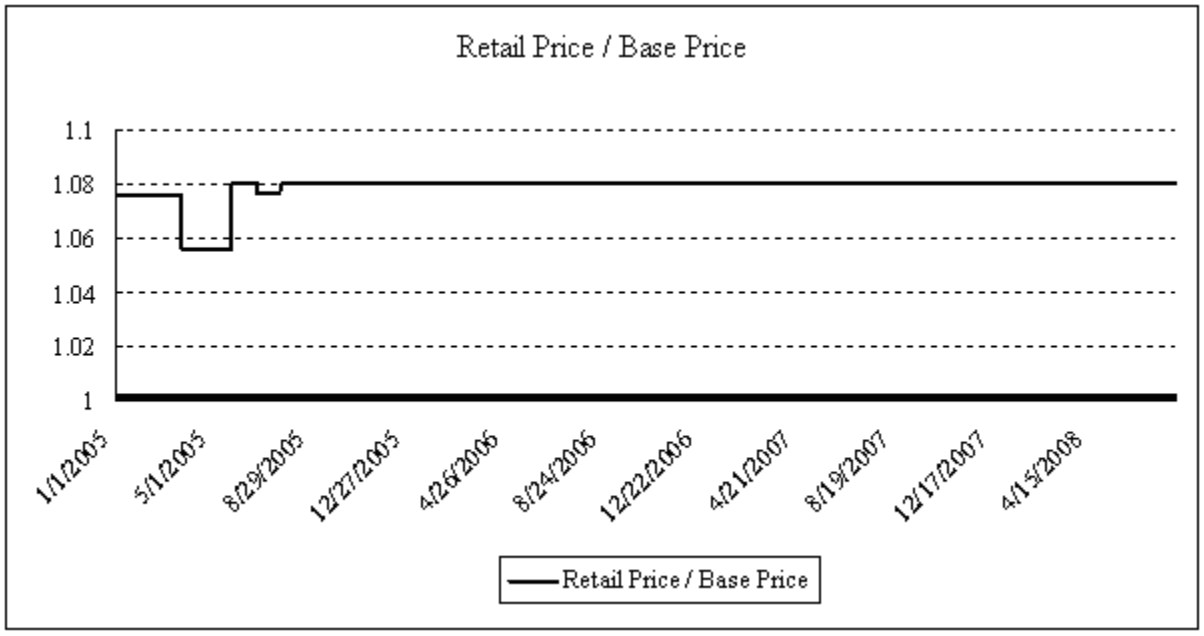

Figure 2, Beijing Retail Price / Base Price

3. Gasoline Data Used in Analysis

The three main data sets we use are the daily retail gasoline price in China in yuan per ton[13], daily retail gasoline price in US in dollars per gallon, and the Euros per liter price of gasoline in France and monthly gasoline consumption in China in tons.

We use the daily retail price of 90 octane gasoline in Beijing to represent the retail price in China.[14] We compared 5 different cities in various parts of China and the prices are almost always the same in each of these cities. 90 octane gasoline is the most common and the lowest grade of gasoline used in China. The other two octane levels are 93 and 95. We convert the prices in Beijing to dollars/gallon illustrated in Figure 3, using the daily USD/Yuan exchange

[13] Ton is a weight unit, and 1 ton = 1000 kg. Since weight=density*volume, ton=density*gallon.

[14] We downloaded all the daily retail gasoline and diesel prices in various cities in China from http://oil.chem99.com/ during our sample period. People may need to call them to get the temporary permit to access the data set.

rate in Figure 4[15]. To convert tons to gallons, we use the fact that the average density of 90 octane gasoline in China is about 0.722 g/ml[16] and 1 gallon = 3.785 liters[17], which means 1 ton of 90 octane gasoline is about 366 gallons.

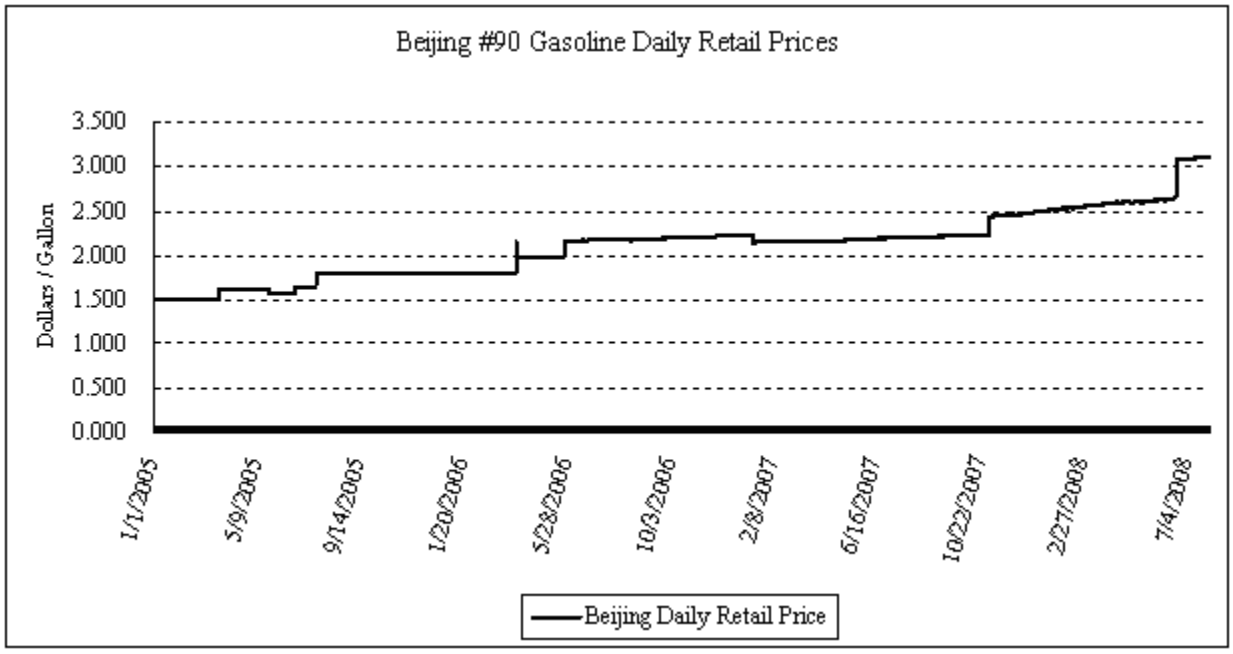

Figure 3, Beijing Gasoline Prices (Dollars / Gallon)

[15] We use the exchange rate from the PACIFIC Exchange Rate Service (web address http://fx.sauder.ubc.ca/). To convert weekend gasoline prices, we used exchange rate from the Friday before the weekend.

[16] See http://www.oilhome.com.cn/jiaoyi/youzhanjiaoyi/shouzhan/200609/59289.html, accessed October 8, 2008

[17] See http://www.thetipsbank.com/convert.htm, accessed October 8, 2008

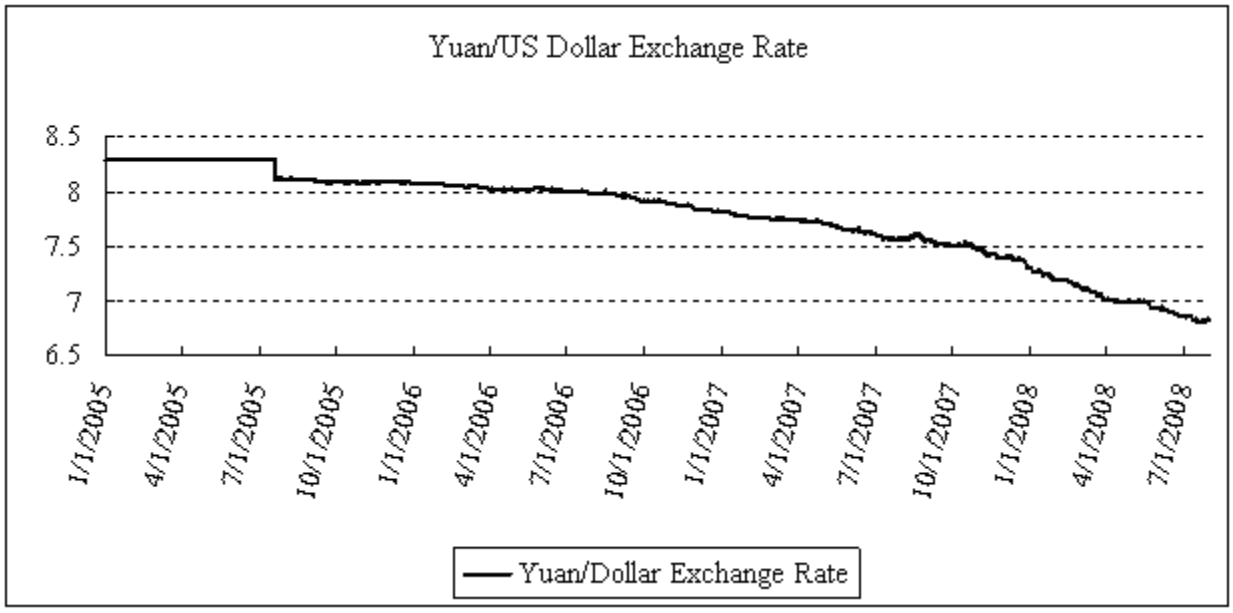

Figure 4, Yuan / Dollar Exchange Rate

We use the retail prices in Los Angeles and New York taken from the United States Energy Information Administration (EIA) to represent the US price, and adjust these prices in two different ways to obtain comparable prices to those in China. The US price is for 87 octane gasoline, which is slightly lower than the octane level of Chinese gasoline. This lower octane is balanced against the fact that the US subjects its refineries to more stringent sulfur content restrictions on the gasoline they produce, which slightly increases refining costs in the US relative to those in China. For example, in California the sulfur content of gasoline should be less than 15 milligrams per gallon (μg/g). The US government requires the sulfur content of gasoline to be below 30μg/g, and in European countries the requirement is 50 μg/g and it will be 10μg/g in 2009. While in China, the requirement is far above that in the USA and Europe, at 800μg/g[18].

[18] See http://www.petrostd.com/news/1268.aspx, accessed October 8, 2008

We now describe the methods we employed to compute comparable gasoline prices in the US and China.

Method One: Use the daily spot price of 87 octane gasoline in LA and NY from the US Energy Information Administration (EIA) and add 30 cents as the retailing margin to obtain the net-of-tax retail price.

Method Two: Use average of the weekly 89 octane and 91 octane retail prices of reformulated gasoline in LA and both reformulated and conventional gasoline in NY with tax from EIA[19], take these price to represent 90 octane gasoline, and subtract the gasoline and other taxes included the in retail price under California and New York tax law.[20] Figures 5 & 6 present retail gasoline prices in LA and NY net of these taxes.

[19] To get the daily price from the weekly data, we simply suppose the price did not change through the week, and we did the same to French data.

[20] In California, retail price tax=18.4 cents/gallon federal tax + 18 cents/gallon state tax + 1.2 cents/gallon state UST fee + around 8.25% sales tax. In New York, retail price tax = 18.4 cents/gallon federal tax + 31.9 cents/gallon other tax + around 4% sales tax. See http://www.gaspricewatch.com/usgastaxes.asp, accessed October 8, 2008.

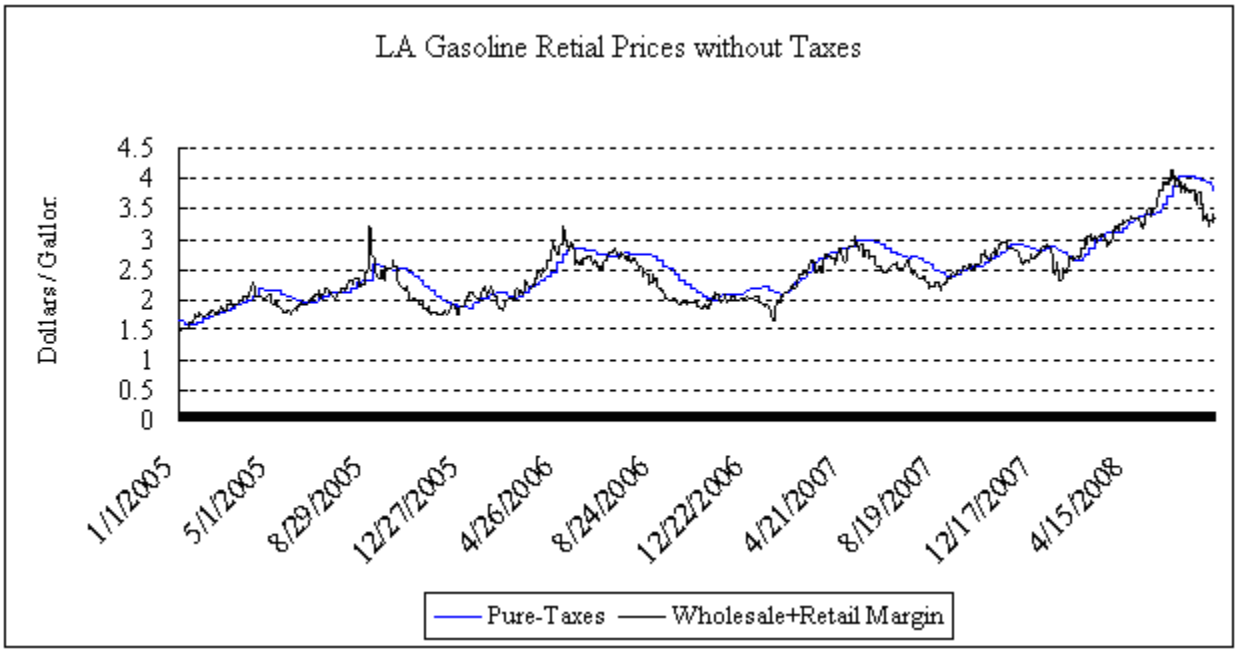

Figure 5, Los Angeles Gasoline Retail Prices without Taxes

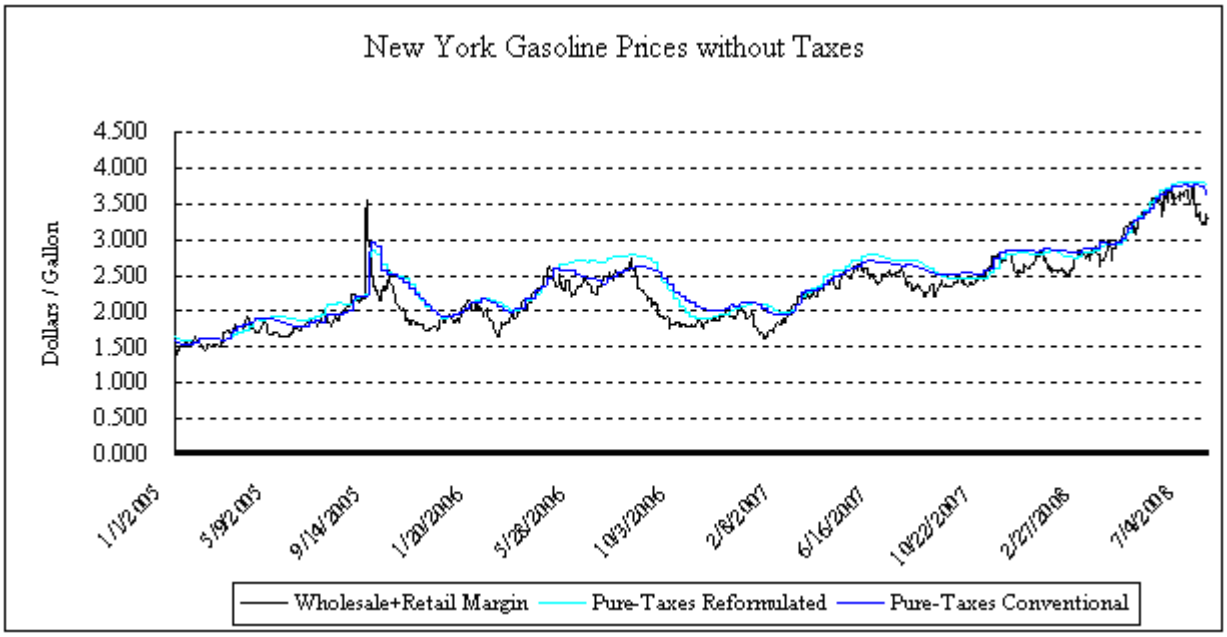

Figure 6, New York Gasoline Retail Prices without Tax

To ensure that our price comparison results are not sensitive to specific features of the United States gasoline industry, we also collect the weekly retail gasoline price net of tax in France from EIA International web-site[21].

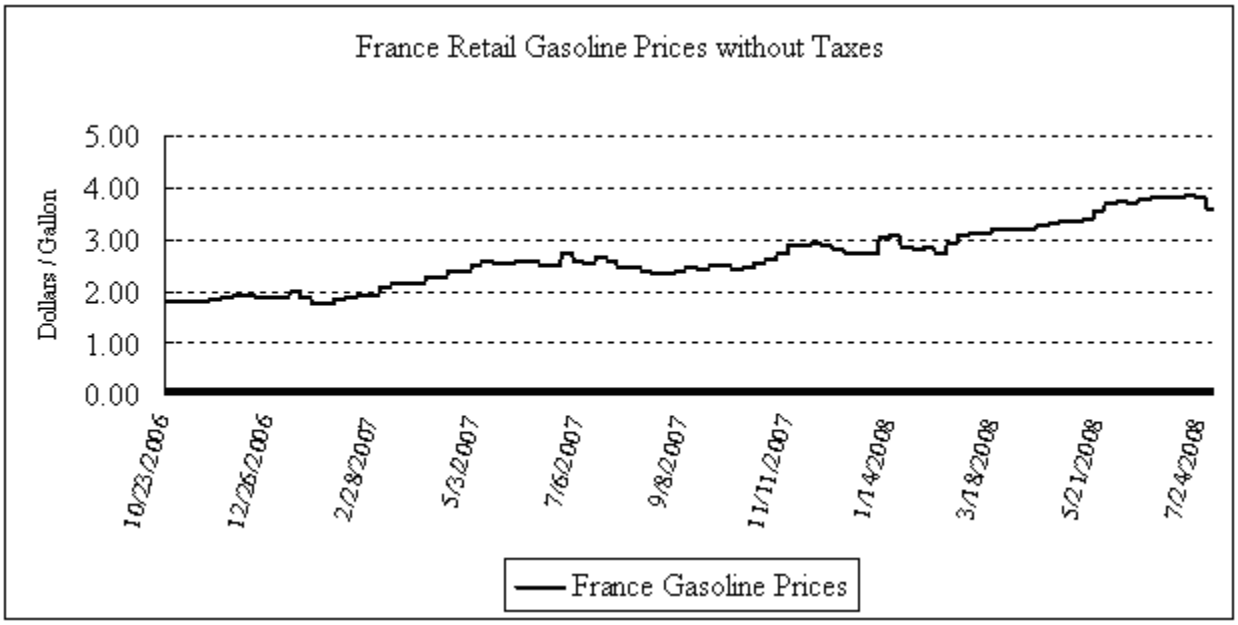

Figure 7, French Gasoline Retail Price without Taxes

Monthly gasoline consumption data for China is difficult to come by before 2007 and 2008. However, we do have information on annual consumption from January 2005 to December 2006.[22]. So we use 2007 data to calculate monthly consumption as a percentage of the whole year's total consumption and extrapolate from these percentages the monthly consumption in other years according to the following equation:

$$CM(I,L) = C(L) * CM(I,2007) / C(2007), \quad I=1,2,\ldots 12 \text{ and } L=2005, 2006$$

[21] See http://www.eia.doe.gov/emeu/international/oilprice.html. The EIA data set has converted the Euros per liter price to dollars per gallon price net of taxes.

[22] The consumption data was obtained from http://oil.chem99.com/ mentioned above, as well as a discussion of how to use the density of the gasoline to convert a ton of 90 octane to a gallon.

where C(J), J=2005, 2006, and 2007 is the annual consumption in year J and CM(I,J) = consumption in month I of year J.

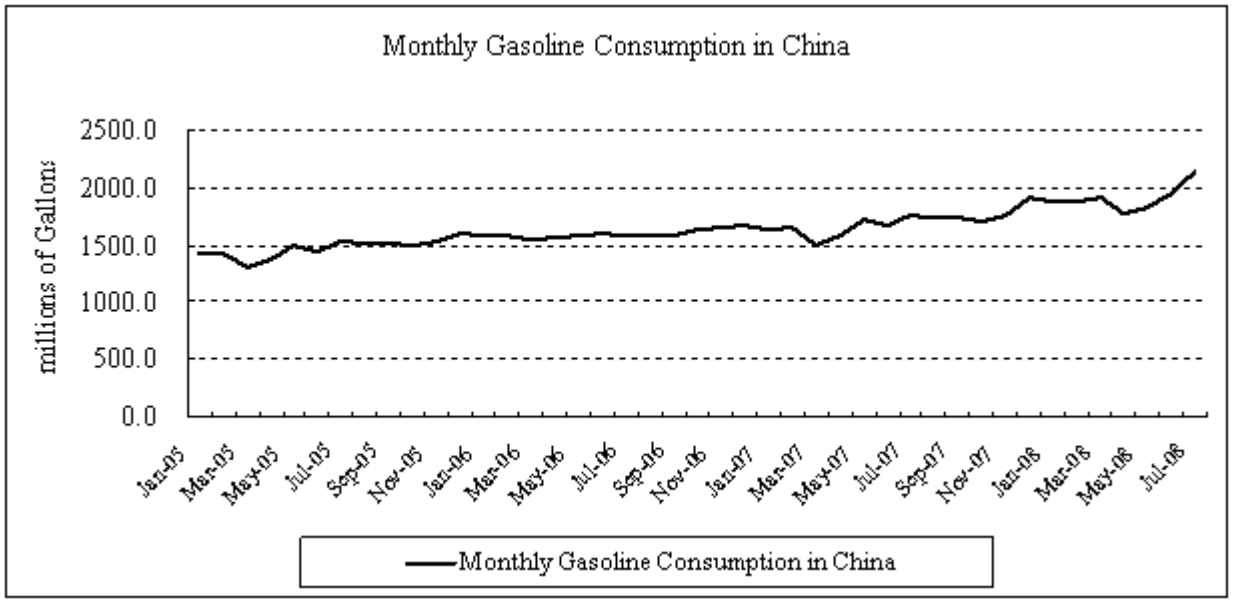

Figure 8, Monthly Gasoline Consumption in China

4. Diesel Fuel Data Used in Analysis

Unlike in the United States, where gasoline is the dominant oil-based fuel, by weight diesel fuel consumption in China is twice that of gasoline consumption. For this reason, we perform a similar analysis with diesel fuel data. We use the daily retail price of #0[23] diesel in Beijing and Shanghai to represent the upper and lower bound on the retail price in China.[24] We compared 5 different cities in various parts of China and found that Beijing has the highest diesel price and Shanghai has the lowest for most of the sample period. # 0 diesel is the most common diesel fuel sold in China. The other levels are 10, -10 and -20. The prices in Beijing and Shanghai converted to dollars/gallon are plotted in Figure 9, using the daily USD/Yuan exchange

[23] This number is the freezing temperature in degrees Celsius for the diesel fuel.

[24] We also downloaded all of this data from http://oil.chem99.com/.

rate. To convert ton to gallon, we use the fact that the common density of #0 diesel used in China is about 0.84 g/ml[25] and 1 gallon = 3.785 liter, which means 1 ton of #0 diesel is about 314.5 gallon.

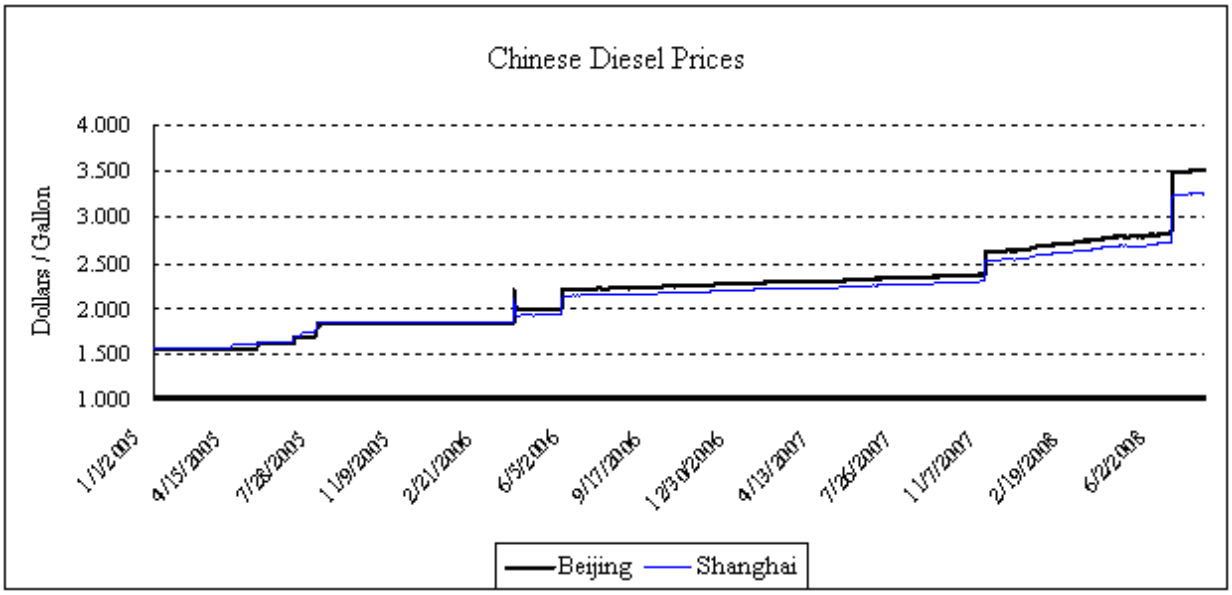

Figure 9, Beijing and Shanghai Diesel Retail Prices

We use price data from New York, the Gulf Coast and Los Angeles to represent the US price. The daily No 2 Diesel Low Sulfur spot data from EIA plus a 30 cents/gallon estimated retail margin is the diesel fuel price that is comparable to #0 diesel fuel price in China. No 2 Diesel Low Sulfur means the sulfur level is lower than 15 parts per million (ppm). In China, the sulfur content requirement is far above the one in the USA, at 2000 ppm[26].

We did not use the second method described above for gasoline to compute a comparable price for the case of diesel fuel because we did not have the necessary data for a long enough period of time. The US Energy Information Administration (EIA) only has weekly retail diesel

[25] See http://www.oilhome.com.cn/zjdy/zjdy/200708/108137.html, accessed October 8, 2008

[26] See http://www.qipei.com/news/detail/info/nation/2007/04/18/200741895117.htm, accessed October 8, 2008

fuel prices for the period January 2007 to the present time, while our sample period is Jan 2005 through July 2008.

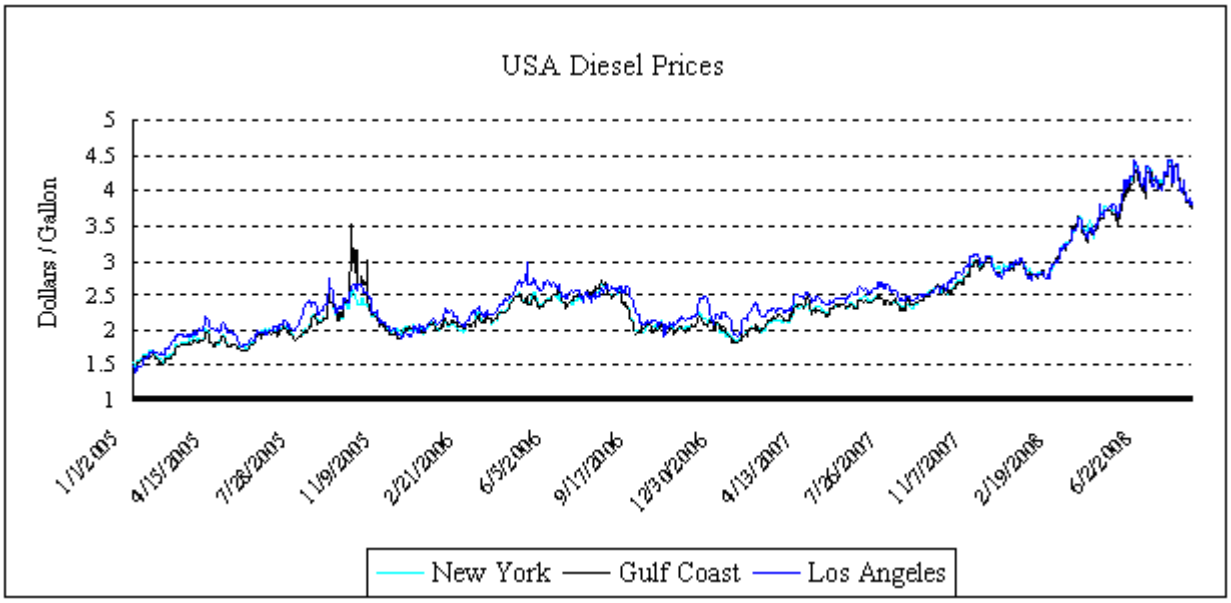

Figure 10, USA Diesel Retail Prices

As was the case for the gasoline prices, we also analyze the weekly retail diesel price without tax in France from US EIA web-site.

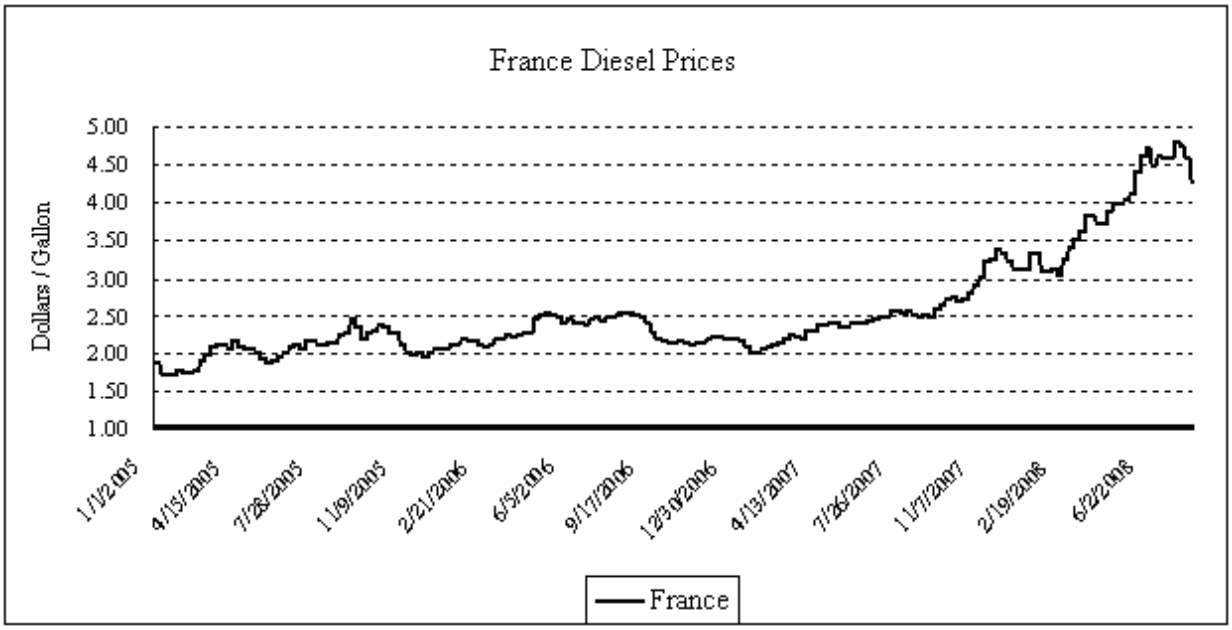

Figure 11, French Diesel Retail Prices

For the monthly diesel consumption data in China, we also have the same problem of gaps in the data in the year 2005 and 2006, which we address in the same manner as described above for gasoline. Comparing Figures 8 & 12, we can see that Chinese diesel consumption is almost twice as large gasoline consumption on a volume basis.

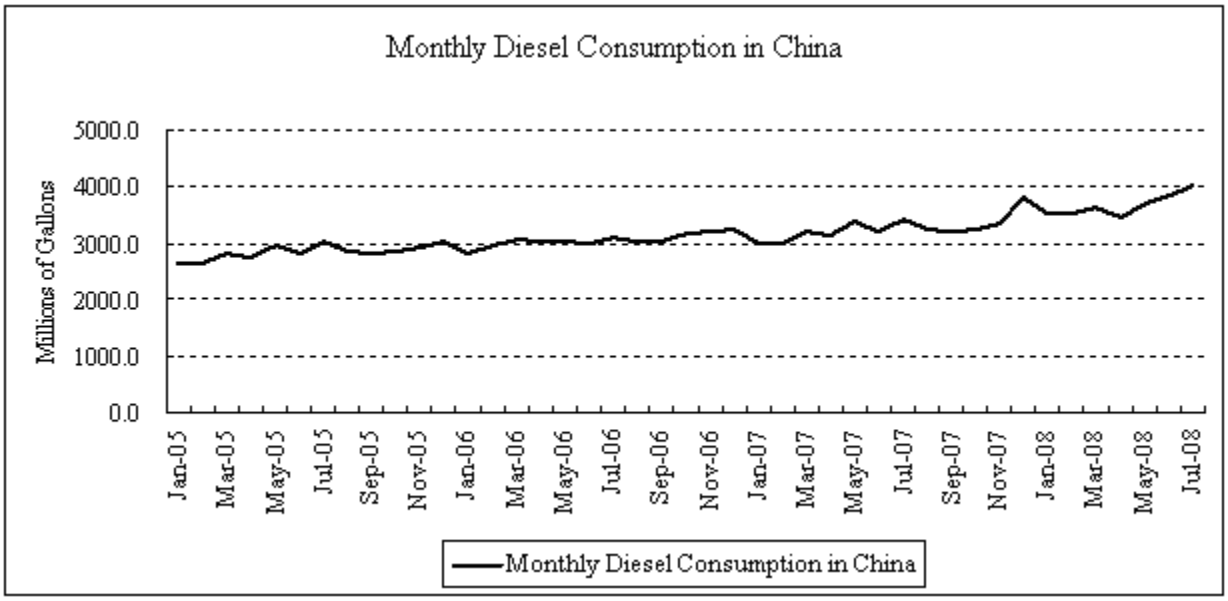

Figure 12, Monthly Diesel Consumption in China (million gallons)

5. Analysis of the Extent of Underpricing

This section considers the extent of underpricing of gasoline and diesel fuel in China. Because there is little tax on retail gasoline and diesel fuel in China, we need to compute comparable gasoline price without tax in Los Angeles, New York and France, and a comparable diesel price without tax in Los Angeles, Gulf Coast, New York and France. Although we tried to match the product sold in the two countries to make the prices comparable, energy in USA and Europe is far cleaner in terms of its sulfur content than it in China, which should cause our estimates of the extent of underpricing to be upward biased. Lower quality products in China in

terms of sulfur content are being compared to higher quality products in the US in terms of sulfur content.

The following graphs show the difference between Chinese gasoline prices and comparable prices in US and France.

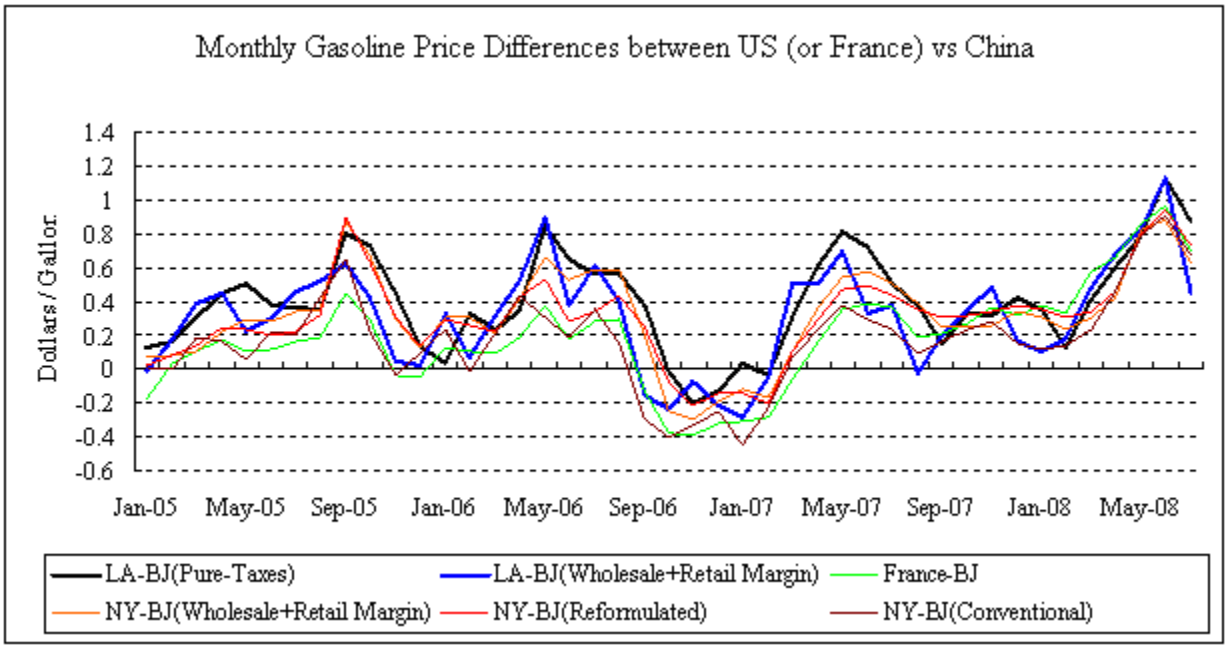

Figure 13, US-China & France-China Monthly Gasoline Price Differences

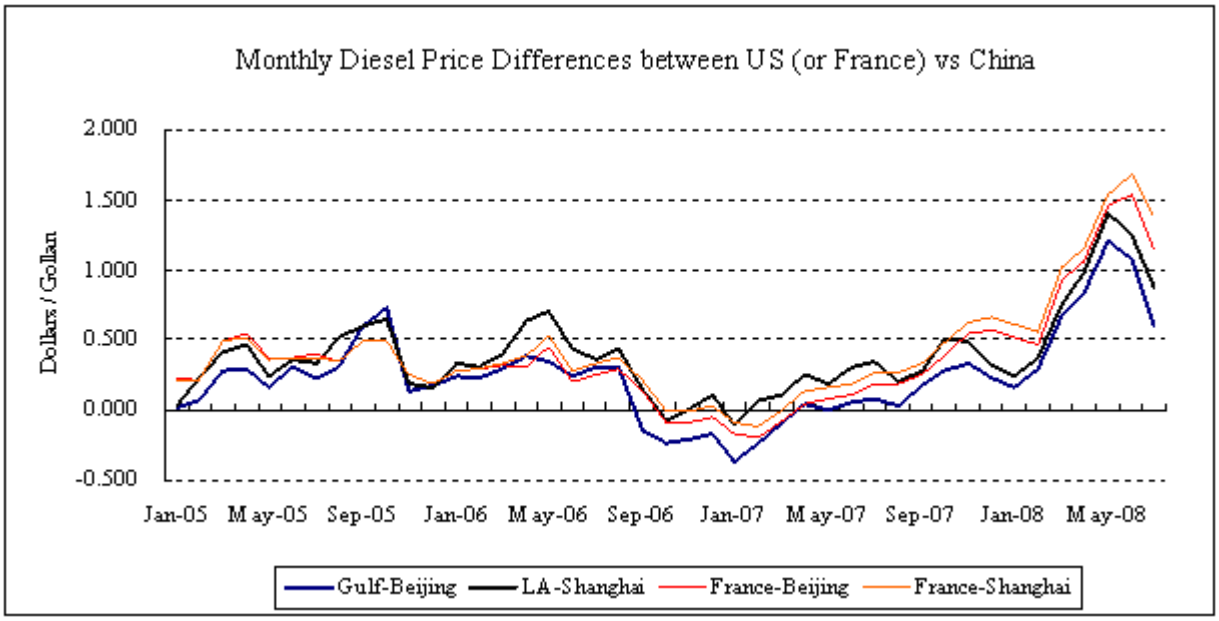

Figure 14, US-China & France-China Monthly Diesel Price Differences

The Chinese gasoline consumption-weighted average gasoline and diesel price gap is between 0.20 - 0.40 dollars/gallon. During certain time periods, prices in China are substantially lower than comparable prices in the United States and France, particularly during periods when the world price of oil increases substantially.

To compute an estimate of the cost of under-pricing, we multiply the difference between the monthly US price and monthly average Chinese price times the monthly consumption in China, which is the monthly dollar revenue shortfall (surplus) from underpricing (overpricing) in China relative to US price. And we performed the same analysis with French and Chinese data. The monthly underpricing revenue gaps shown in Figures 15 and 16 are computed using the following equation for each month:

$$\text{US-China Gap} = (P(\text{US}) - P(\text{China}))*C(\text{Monthly}),$$

For US-China diesel gap, we use the Beijing (BJ) and Shanghai (SH) price data as upper and lower bounds on the Chinese prices. From Figure 10, we can see that the Los Angeles (LA) and

Gulf Coast (GC) prices are upper and lower bounds for the average USA price. So we use LA-SH gap and GC-BJ gap to represent the upper and lower bound for the US-China gap. The graphs show similar trends for the extent of under-pricing for US-China prices as well as France-China prices.

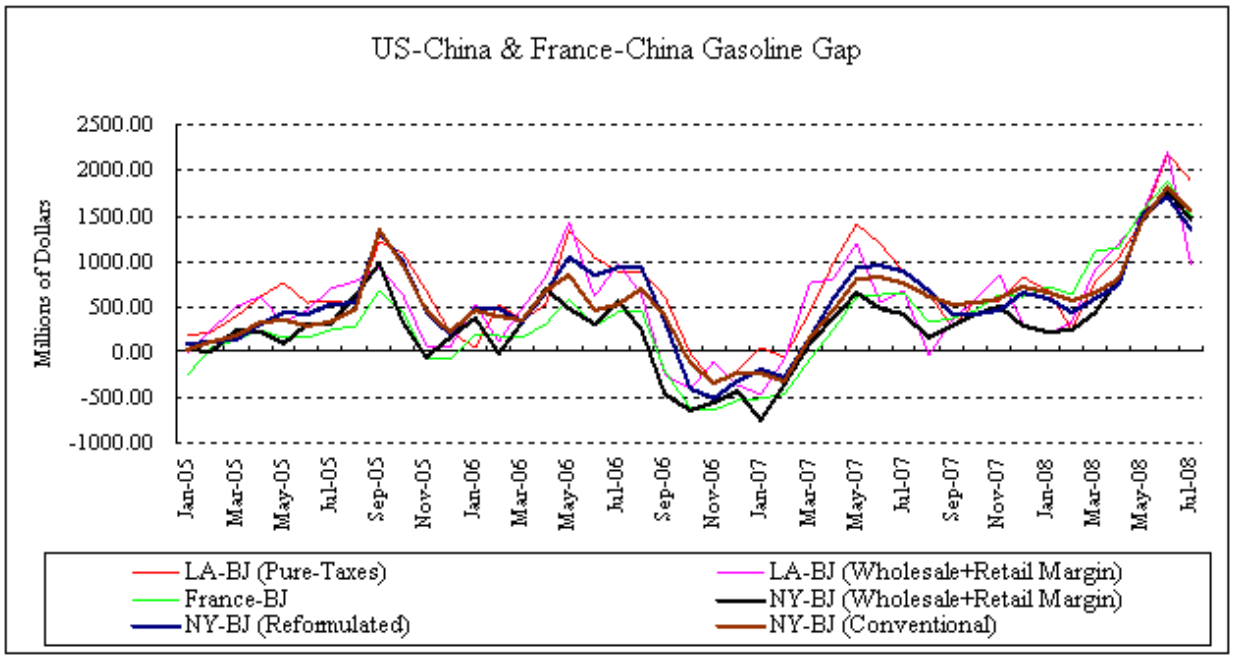

Figure 15, US-China & France-China Gasoline Gap

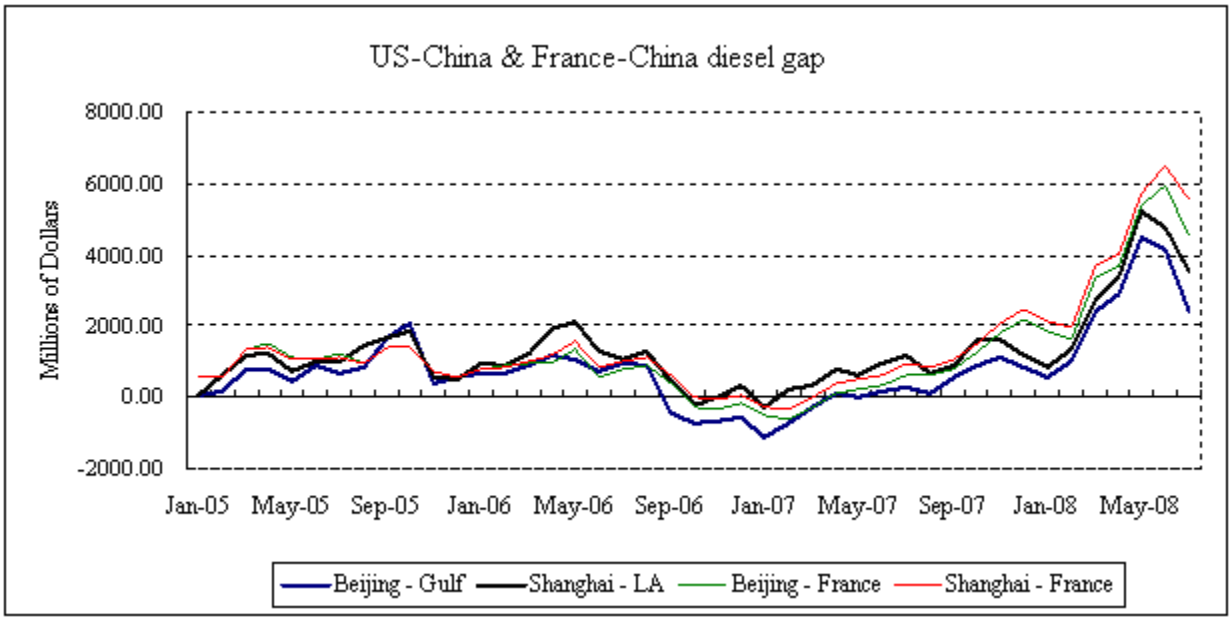

Figure 16, US-China & France-China Diesel Gap

For the period Jan 2005 to July 2008, the aggregate gasoline shortfall between the US and China is about 22 billion dollars, which averages about 6.1 billion dollars each year. The aggregate gap between France and China is about 14.7 billion dollars, which averages about 4.1 billion dollars per year.

For the period Jan 2005 to July 2008, the upper and lower bounds on the aggregate diesel revenue gap between the US and China are about 55 and 34 billion dollars, which are 15 and 9.5 billion dollars per year. The upper and lower bounds on the aggregate diesel gap between France and China are 61 and 52 billion dollars, which are about 17 and 15 billion dollars each year.

We also compute the monthly average percent underpricing gap for gasoline and diesel fuel, which is equal to

$$\text{Percent US-China Gap} = 100*[(P(US) - P(China))]/\{P(China)]$$

These results are plotted in Figures 17 and 18. In most months there is a modest amount of percentage underpricing of both diesel fuel and gasoline, in the range of 10 percent to 30 percent

of the Chinese price. The higher percent underpricing is highly correlated with the world price of oil, with higher prices associated with a greater percentage underpricing. Following this rapid price increase, the extent of underpricing declines, but remains positive. The only times it turns negative is when the world oil price rapidly declines. This occurs because the Chinese government never reduced the yuan-denominated price of gasoline and diesel fuel throughout our entire sample period.

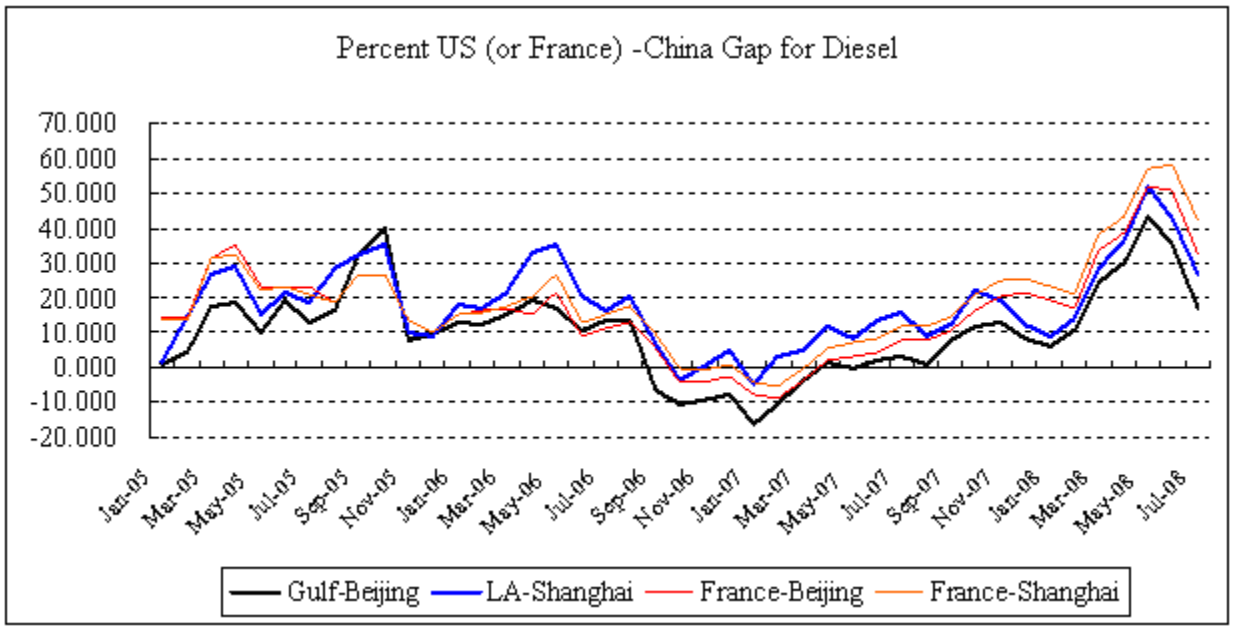

Figure 17: Percent Underpricing Gap for Diesel Fuel in China

The extremes of underpricing are largest for diesel fuel versus gasoline. For example, in mid-2008 the percent underpricing of diesel fuel was between 40 percent and 60 percent depending on the comparison price used, versus 30 percent to 40 percent for gasoline depending on the comparison price used.

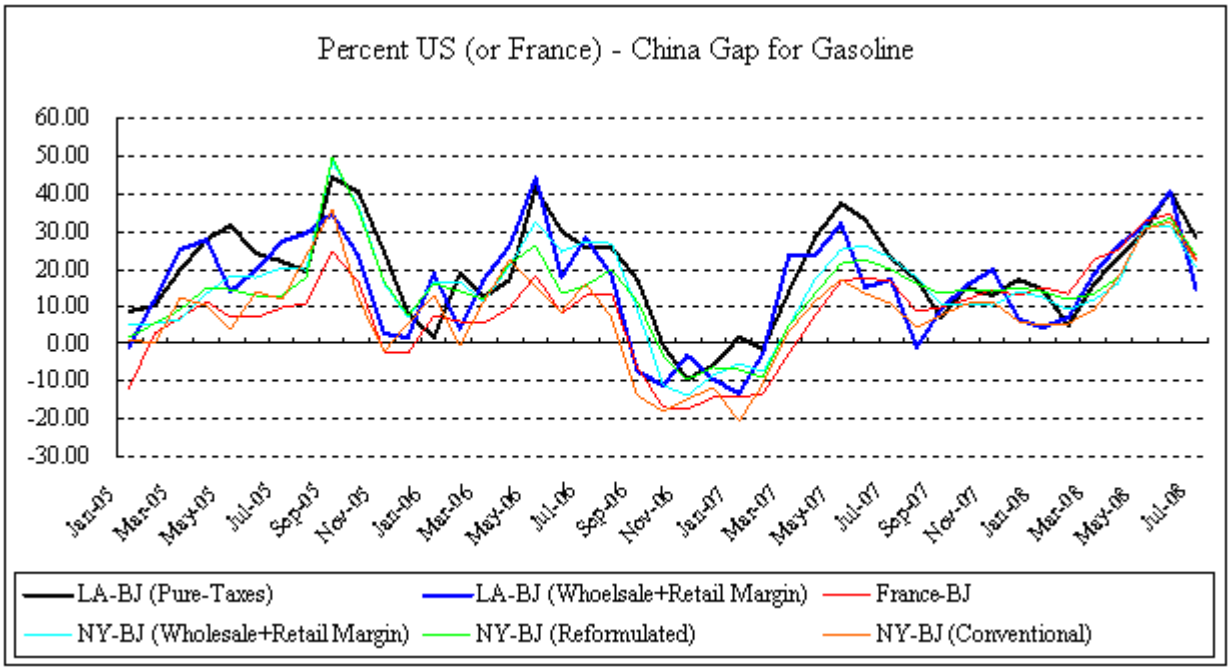

Figure 18: Percent Underpricing Gap for Gasoline in China

6. Demand Response from Correcting Underpricing

This section estimates the extent to which annual consumption in China is reduced as a result of correcting the underpricing of gasoline and diesel fuel. We employ the following very simple model for each month of our sample period. We assume a fixed demand elasticity and compute for each day d, compute

$\Delta(d) = (P(US,d)-P(China,d))/P(China,d)$ = percent underpricing in China for day d.

We then choose own-price elasticities, ε, of -0.05, -0.1, -0.5 and compute for each day of the month

$\Phi(d) = \Delta(d)^* \varepsilon$ = implied percent change in consumption for day d.

We then compute the mean value of Φ(d) over all days in the month and multiply this average mean consumption change by the actual monthly consumption in China. This is the estimated change in consumption for the month that would result from elimination of underpricing.

We only use the modified Los Angles retail price and Beijing retail price to do this computation. Figures 19 and 20 plot the monthly consumption changes for the three values of the own-price elasticity given above.

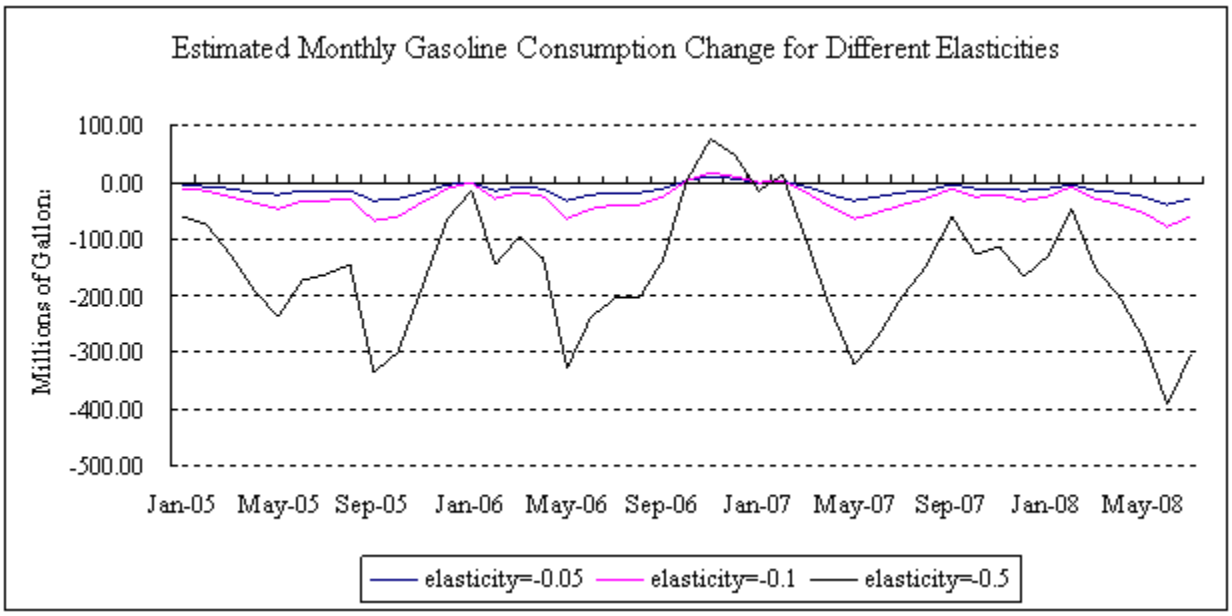

Figure 19, Estimated Monthly Gasoline Consumption Change for Different Elasticities

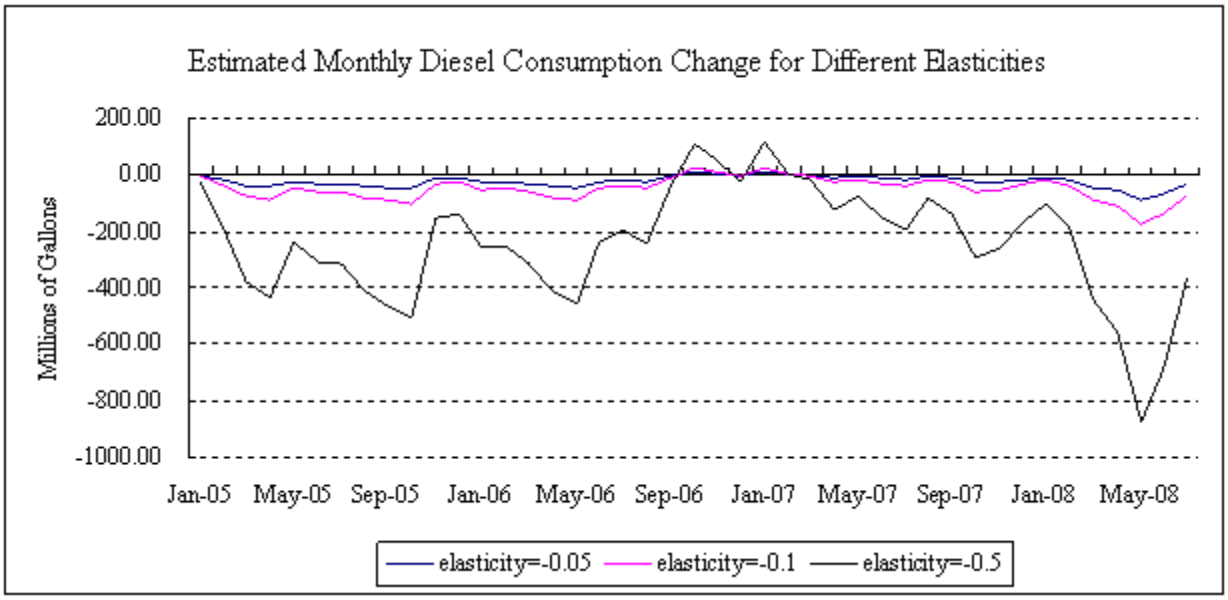

Figure 20, Estimated Monthly Diesel Consumption Change for Different Elasticities

In the Figure 21, we use the information in Figures 19 & 20 to estimate the change in oil consumption using the following formula:

Change in oil consumption in bbl/day for that month = max ([Gallons of oil per month from Figure 19]/[19.15], [Gallons of diesel fuel per month from Figure 20]/ [7])/[days in month][27]

[27]Approximately 19.15 gallons of gasoline and 7 gallons of diesel fuel are obtained per barrel of oil.

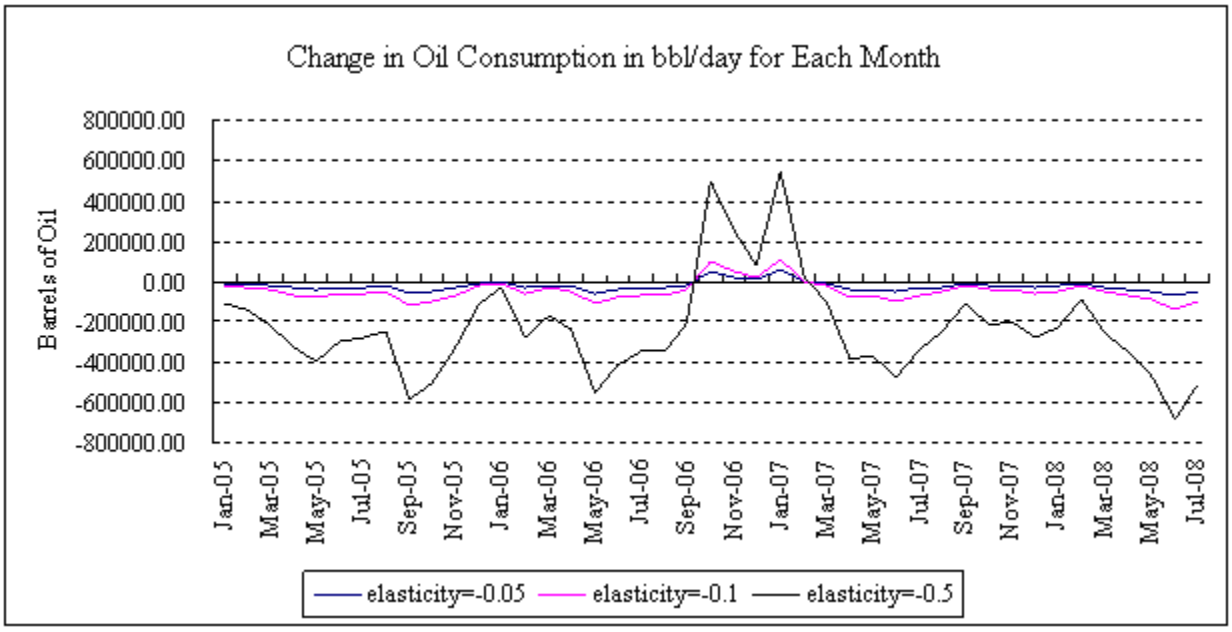

Figure 21, Estimated Change in Oil in bbl/day for Each Month with Different Elasticities

These results demonstrate that unless the own-price elasticities of demand for gasoline and diesel fuel are on the order of -0.5, underpricing of gasoline and diesel fuel is unlikely to have had much of an impact on China's oil consumption from 2005 to 2008. The own price elasticity of -0.5 is far outside the high end of the short-run own price elasticities estimated in country-level studies such as Cooper (2003). The highest short-run own price elasticity obtained by Cooper was -0.1, for Iceland. His overall conclusion was that the short-run own-price elasticities are extremely small for all of the countries considered. Hughes, Knittel and Sperling (2007) estimated short-run gasoline demand elasticities for the United States consistent with these elasticities, in the range of -0.034 to -0.077 for the period 2001 to 2006, although they also reported estimates in the range of 0.21 to -0.34 for 1975 to 1980. So that if the short-run demand elasticity for gasoline and diesel fuel in China is similar to that in the United States for

the period 1975 to 1980, then underpricing of gasoline and diesel fuel could have been a significant contributor to China's growth in the demand for oil over the period 2005 to 2008.

7. Caveats and Conclusions

In this we paper found substantial empirical support for the underpricing of gasoline and diesel fuel in China over the period January 2005 to July 2008. Our estimates imply that Chinese gasoline and diesel fuel consumers are being provided with a subsidy of between 15 billion and 23 billion dollars per year over this time period (depending on the counterfactual prices used). Over our sample period the extent of under-pricing of diesel fuel averaged between 10.7% and 18% of the Chinese price of diesel fuel (depending on the counterfactual price used) and the underpricing of gasoline was roughly between 8% and 19% of the Chinese price of gasoline (depending on the counterfactual price use). However, the likely very small short-run elasticities of demand for gasoline and diesel fuel imply that this underpricing does not explain a very large fraction of the increase in demand for oil by China since 2005. However, if the own-price elasticity of demand for oil in China is in the range of -0.5, then this underpricing can explain a noticeable fraction of the increase in demand for oil from China over the 2005 to 2008 time period.

References

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Hughes, J./E., Knittel, C., and Sperling, D (2008) "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand," *The Energy Journal*, vol 29(1), 93-114.