

**Impact of The Open-door Policy and WTO Membership
On China's Oil Industry**

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Abstract

This paper looks at how China's domestic oil industry and market were affected by the open-door policy (1979) and entry into the WTO (2001). The paper will focus on the changes in the elasticity of demand and Lerner Index following these two events. The paper also looks at the business strategy of foreign oil companies and the future prospects of the Chinese oil industry.

1. Introduction

The petroleum industry is one of the major pillars of the Chinese economy. It plays an important role in the development of the national economy and the improvement of the Chinese people's standard of living. Since People's Republic of China was established in 1949, China's petroleum industry was faced with strongly affected by the open-door policy and World Trade Organization (WTO) membership. In 1979, the Chinese Prime Minister Xiaoping Deng firstly mentioned the idea of accepting foreign access into all kinds of fields, and there was a successful innovation which has affected the whole country for over 30 years. Moreover, since 1986, the Chinese government had begun negotiations for entry into the World Trade Organization (WTO). After 15 years, China finally reached her goal of becoming a member of the WTO in December 2001. Accession to the WTO is a huge success in China's economic development, modernization and integration into the world economy.

With the launch of the open-door policy in 1979, the Chinese economy was growing faster than ever before. At the same time, China's industry also underwent a massive transformation. Therefore, by the time the economic reforms yielded their first results, China had already begun to feel thirst for oil. This paper will investigate the economic impact of those transformations on china's petroleum industry. In particular, we will compare the estimates of the Lerner Index (which measures market power) and price elasticity of demand before and after China started it open-door policy and, its entry into the WTO.

The main source of oil demand and price data used in the regression is the BP Statistical Review of World Energy. It is found that the Lerner Index of the petroleum industry in China has dramatically risen since the 1979 open-door policy. However, WTO membership did not create as much an impact as the

open-door policy did. The Chinese petroleum industry still holds considerable monopoly power and the local producers (such as Sinopec and China National Petroleum Corporation (CNPC)) still dominate the domestic market. It is also worth noticing that the government influences and protects the market power of the Chinese petroleum industry. It might be necessary for the Chinese government to keep the control of the petroleum industry because of the National Security Strategy. As a result, this situation is not expected to undergo any significant change in the near future.

The paper is divided into five sections. In section 2, we will present a brief background of China's petroleum industry. In section 3, we will estimate the price-cost margin using OLS and compare the domestic petroleum market power and price elasticity before and after the open-door policy as well as before and after China's entry into the WTO. Section 4 will empirically analyze the effects of China's entry, distinguishing between short-term and long-term effects. The future prospects of China's petroleum industry will be discussed in Section 5. This analysis will explain why the effects were not as significant as was expected. The conclusion will be presented in section 6.

2. Background

2.1 Historical development of the oil industry in China

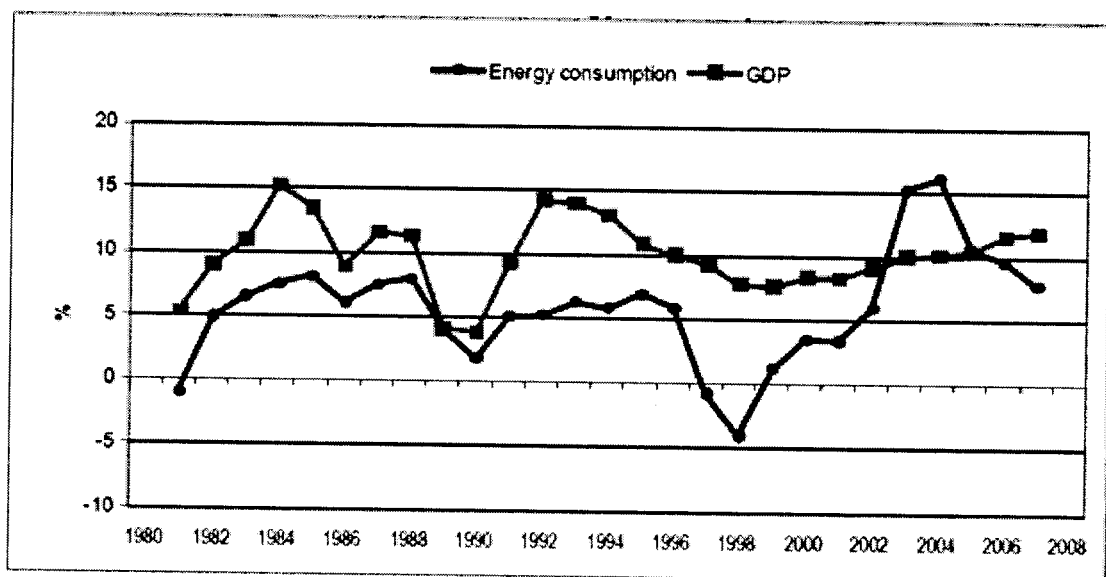
China's oil resources are very large. The observable geological oil reserves amount to about 18.8 billion tons. According to the Chinese Ministry of National Bureau of Statistics, there are about 500 sedimentary basins which can be exploited in China. The total area is about 6.7 million square kilometers, from which the area of land-based sedimentary basins is about 5.5 million (82%) square kilometers while the sea-based sedimentary basin is 1.2 million (18%) square kilometers. In accordance with the prediction of second national oil and gas resources assessment, the total amount of China's oil resource is about 90.6 billion tons, of which 66 billion tons are onshore and 24.6 billion tons are offshore.

China's domestic fuel consumption was relatively low up to the late 1970s. Petroleum consumption was growing at a manageable rate of 18.44 percent per year in the period between 1964 and 1978 since China's domestic economy was not sufficiently developed and the size of domestic manufacturing was relatively small. For example, the production of passenger cars was 196 units and the production of commercial vehicles was 86,970 in 1970, which is even lower than other Asian developing countries, i.e. 1 car for every 5,711 Chinese in contrast to India's ratio of 1 to 902 or Thailand's 1 to 175 (Holweg, Luo, Oliver, 2005).

Since the Chinese government started its open-door policy (the policy whereby, in 1979, China allowed the entry of multiple foreign enterprises) and economic reform in 1979, China has made huge progress in its economic development. For instance, The Gross Domestic Product (GDP) in China dramatically rose from RMB 454.56 billion in 1980 to RMB 1871.83 billion in 1990 Reminbi ("RMB" or "CNY",

the official currency of the People's Republic of China). The household consumption expenditure also rose from 238 RMB in 1980 to 833 RMB in 1990. On the other hand, since the production of vehicles increased from 222,018 in 1980 to 1,066,742 in 1992, China had caught up with other developing countries with an annual energy consumption rate of about 20 GJ per capita in 1985. In the mid-1990s, China's petroleum consumption was among the world's five largest (Lim, 2010).

Figure 1: Growth rates of GDP and energy consumption 1980-2007



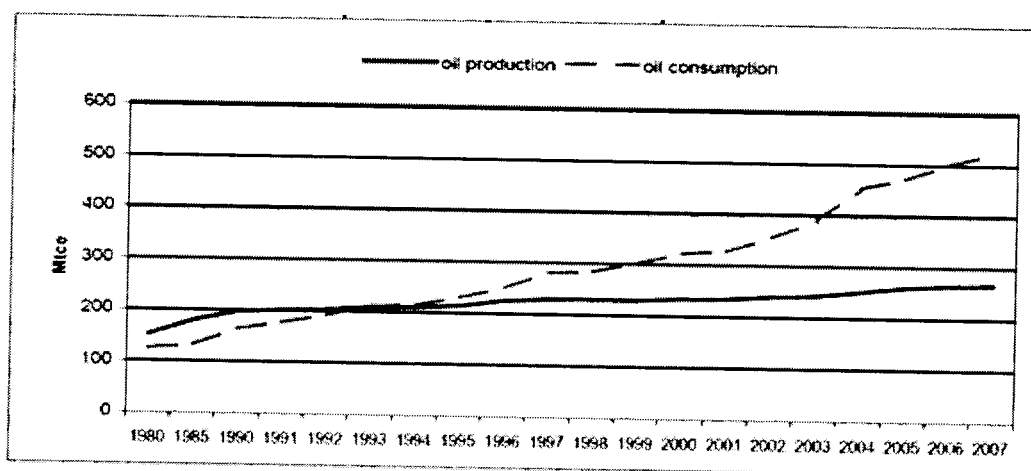
Source: China Statistical Yearbook 2008, Tables 6-8, and Sinton (2005)

However, it is interesting to note that China's crude oil production did not rise as fast as consumption. Production rose about only 30% during the period between 1997 and 1990 while consumption in 1990 was about four times larger than consumption in 1979. Since oil production shot up by a factor of 10 from 11 million tons in 1965 to 106 million tons in 1979, however, its growth between 1979 and 1993 cooled down to 2.3%. In the period between 1994 and 2000, the growth of crude oil production even slowed down further to an average of 1.64% per year while the yearly growth rate of consumption was about 8.5% (Lim, 2010).

It is obvious that the domestic production of petroleum could not satisfy domestic demand and China's thirst for petroleum became more apparent. As the petroleum usage began to exceed domestic production, China began to realize it could not maintain its original principle of petroleum-self-sufficiency and slowly started to move away from this principle as early as 1986.

There were also two other factors which accelerated China's change of strategy. The first and foremost condition was that the booming of economic revitalization encouraged an ambitious development of the country's infrastructure by the end of 1970s. The Chinese government started to allow foreign investment to come into China which caused the consumption of petroleum to rapidly increase. The second condition is a special situation which took place in the middle of the 1990s. The Chinese considered that their three main petroleum-producing locations, including the field in Daqing, would soon run dry. On the other hand, the Chinese encountered technological difficulties in exploiting Xinjiang's oil field while the offshore East China Sea oil was considered too expensive to exploit. As a result, the Chinese began to understand that petroleum self-sufficiency was not feasible anymore and they have to find another way to satisfy rising domestic demand. Finally, they decided to import oil from other countries.

Figure 2 : Crude oil production and consumption in China



Source: China Statistical Yearbook, 2008

The import of crude oil became very important since 1993. China's imports of crude oil grew at an annual average rate of 9.1% in the 1990s, from 2.92 millions tons in 1990 to 35.33 million tons in 1997 when China was on the verge of joining the WTO. The import of crude oil continued to grow and the amount of crude oil imports in China was about 234.6 million tons in 2010 (Lim, 2010).

As the import of crude oil grew larger, China started to face many problems related to cooperation and conflicts with other countries in the regions. For example, cooperation between China and ASEAN countries like Indonesia, Brunei, Malaysia (palm oil) was a very important project about the resource in Pearl River Delta region. These ASEAN countries are all oil-rich states and they take charge to export their crude oil to China. According to Lim (2010), the potential of the Thai Isthmus of Kra as a shortcut for pipelines, tankers, and railway supplying oil to China or the prospects of Sino-Vietnamese issues are just some of the little-studied subjects with significant implications for the Pearl River Delta region. On the other hand, trade between China and Northeast Asia is also very important. In fact, China has shifted the oil diplomacy from Japan to Russia which is always considered to be one of China's most important Allies since the middle of the 20th century. Ironically, China's action to increase its oil ties with Russia in the 1990s seemed to be more against Japan who was China's former oil trading partner. Besides cooperation, China was also facing conflicts with other countries such as Japan. For instance, the Sino-Japanese maritime energy resources is the area where Chinese energy activism rose.

In summary, as a developing nation making the shift to a market economy, with the increase of oil demand and market size accompanying such economic growth, China had to face more and more cooperation and conflict with other states, especially surrounding countries. In this case, China needs an international and

fair organization to defend its legitimate rights and interests. This is the reason why China decided to join the WTO. After almost 15 years negotiations to join WTO since 1986, China finally became an official member in December, 2001.

2.2 Reform of China's Oil Industry

Before the 1980s, China's ministry of Petroleum Industry controlled the whole country's oil and gas production systems and management, including the oil fields' administration bureaus and oil refineries. With the Chinese open-door policy started in 1979, the Chinese government restructured its ministry of Petroleum Industry to cater for the requirements of the international oil market, with the purpose of joining the WTO. As a result, the Petroleum Industry Department was separated into government and administration and enterprises in the period between 1980 and 1998. In 1983, the China National Offshore Oil Corporation (CNOOC) was established and it was in charge of the offshore oil Administration/Production section which used to be part of the Petroleum industry's government function. The offshore oil and gas production system was established through the Bohai Sea, East China Sea and South China Sea branches established under CNOOC (Guo, 2007).

In 1988, the Ministry of Petroleum Industry was abolished. Instead, the Chinese government set up another organization called China National Petroleum Corporation (CNPC). The CNPC controls the land-based oil production system in China, i.e., to carry out the onshore oil exploration and development. Furthermore, in 1998, CNPC was reorganized and separated into the new CNPC and Sinopec. The new CNPC operations began to center on the land-based oil field development while Sinopec was in charge of oil refining and petrochemical marketing.

In 2000 when China was on the verge of joining the WTO, the new CNPC and Sinopec restructured again and became holding companies. Each of them set up a limited company with responsibility for production and operations. Under its holding company CNPC, the PetroChina Co., LTD is in charge of exploration and development of those oilfields in northern and western parts of China, while the Sinopec Corp is mainly responsible for exploration and development in the eastern and central parts of China under its holding company Sinopec. In February 2001, CNOOC set up its own limited company CNOOC Ltd which is in charge of offshore oil and gas exploration and development.

In 2004, the major three petroleum companies redistributed their rights and the management distribution seems fairer than before. CNPC and Sinopec require parts of offshore exploration and development from CNOOC. On the other hand, CNOOC was also given parts of those rights of onshore oil field by those two companies. At that time, the modern petroleum industry structure was basically in place (Guo, 2007).

2.3 Organization

Although the monopoly power of China's petroleum industry seemed to be weakened after the reform, China still controls its oil production industry through the major three petroleum companies. The China National Offshore Oil Corporation (CNOOC) is responsible for the offshore oil administration and production. It became a holding company in 2001 and the Chinese government holds 54% of its (CNOOC Annual Report 2009). The China National Petroleum Corporation (CNPC) is responsible for land-based oil production. It became a holding company in 2000 and the Chinese government holds 86% of its shares (CNPC Annual Report 2010). Sinopec is responsible for the downstream petroleum and petrochemical production and marketing. It was changed to

become a holding company in 2000 and the Chinese government holds 75 percent of its shares (Introduction of Sinopec Lt, 2009).

China has traditionally protected its own oil industry by forbidding foreign companies from entering the Chinese market. This situation was changed only after 1980 with the open-door policy. However, PetroChina and Sinopec, which are both state-run companies, still control the refineries which produce 90 percent of domestic gasoline and diesel. They also control most of the Chinese gas stations and they are able to squeeze out independent operators and consumers by restricting their supplies of gasoline. That is one of the reasons why Chinese citizens are not satisfied with the fact that gas prices remained unchanged in spite of the occasional decrease of worldwide crude oil price; but they have no way to complain.

2.4 The effect of WTO membership

The effect of WTO membership began when the Chinese government was negotiating to join the WTO. In 1982 and 1993, the Chinese government started to allow foreign access to oil fields and resource deposits. The government announced the regulation of foreign corporations over land-based oil resources and regulations for offshore and foreign oil resources. These regulations were established for four international biddings about exploratory offshore oil field development in 1982, 1984, 1989, 1993, and four international biddings in exploratory land-based oilfield development in 1993, 1994, 1995, and 2006. In continuation, CNOOC established another regulation for foreign access in 1999, 2000, 2002, 2003, 2004 and 2005. However, those regulations restrict the degree of freedom of oilfield development. For example, the regulations prescribe the contractual methods for foreign capital and capital ratios: product manufacturing

and distribution contracts; 51% by China and 49% by foreign entities. The regulations also prescribe which entities are in charge of contracts. For example, CNPC and Sinopec would take charge in the contracts about land based oilfield exploitation with foreign oil companies while CNOOC would take charge in the contracts about sea based oilfield exploitation with foreign oil companies. Therefore, the oilfield development is still controlled by the Chinese government even though they allow the foreign companies to join in (Guo, 2007).

Secondly, there is technical and managerial advancement in the fields of Chinese oil and energy by foreign corporations such as oil majors. Due to China's decision to open up the offshore oilfields, about 70 foreign firms entered offshore exploration development and established tie with CNOOC. Since 1997, foreign oil companies have signed 36 new development contracts with CNOOC. They participated in the offshore exploration development and contributed to an increase in production output from China's offshore oil fields and enlarged the amount of confirmed recoverable reserves. On the other hand, since the foreign companies entered into China's onshore, about 10 foreign majors such as Shell and Texaco have developed 21 provinces in China, 60 exploratory oilfield development projects and 9 target regions projects (Coleman, Fry, Boughner, 2002).

Thirdly, in response to China's market growth and the increase of oil and energy consumption, the foreign majors actively advanced into the fields of oil and gas substitutes since the second half of the 1990s. For instance, in the period 1998-2006, the foreign oil majors such as ChevronTexaco, BP and ConocoPhillips signed up 28 contracts with Chinese enterprises and invested a total of 100 billion dollars to develop 37000 square kilometers in target resource sites. The reserves in all these areas total 3 trillion square meters (Hays, 2011).

Due to the WTO effect, there are about 7 billion US dollars in foreign investment which have been brought into China in the period 1982 - 2005. Foreign companies including Exxon, BP and Royal Dutch/Shell are currently doing their business in China and they are involved in exploration and running gas stations under their names. However, the Chinese three state-run companies still control the oil industry, including 90% of domestic production of gasoline and diesel. According to all the information above, the market power in China's oil industry changed little following foreign entry.

3. Estimation of market power

In this section, we measure market power in China's petroleum industry. Although the Chinese government has carried out a number of reforms including allowing foreign access and restructuring of major oil companies in its petroleum industry, the three state-run oil companies are still considered to wield monopoly power. We start with a general Structure-Conduct-Performance (SCPP) model based on Wolfram (1999).

3.1 General Model

3.1.1 Theoretical Framework

We measure market power as Wolfram (1999) did to measure market power in the British Electricity Spot Market. We can use a similar model by assuming that all domestic petroleum sectors act as a collusive group facing the foreign access in a previously closed market.

In the Wolfram test of market power, the time-invariant demand function is

$$D_t = D(P_t, X_t, \epsilon_t)$$

Where t is the index of half-hour period on a particular day, P is the pooled price in British electricity market, X is a vector of observable factors that shift demand. ϵ is the error term. The profit function is

$$\pi_i^m(q) = P_t(Q_t, X_t, \epsilon_t) q_i - C(q_{it}, z_{it}, \epsilon_{sit})$$

where i is the index of the supplier who supplies q_i while z_i is also a shift parameter and ϵ_{si} is the error term of the cost function. P is the inverse demand function, Q is industry demand and C is the total industry cost function. From the

first order condition, we get

$$MC_i(q_{it}, z_{it}, \epsilon_{sit}) = MR_i(Q_t, X_t, \epsilon_t)$$

Since

$$\frac{\Delta q}{\Delta p} = D' \rightarrow \Delta q = D' \Delta p = \frac{\Delta p}{p'}, \text{ then } q \Delta p = \Delta q (p - MC) \rightarrow q \Delta p = \Delta p * \frac{p - MC}{p'}$$

Therefore,

$$MC_i(q_{it}, z_{it}, \epsilon_{sit}) = p_{it} + q_{it} p_{it}' = MR_i(Q_t, X_t, \epsilon_t)$$

Rewriting this formula, we get

$$\left| \frac{p_{it} - MC_{it}}{p_{it}} \right| = \left| \frac{q_{it} p_{it}'}{p_{it}} \right| = \left| \frac{1}{\epsilon} \right| = L \text{ (Lerner Index)}$$

In this case, the price-cost margin can be written as $\left| \frac{p - MC}{p} \right| = \left| \frac{1}{\epsilon} \right| = L$ where L (Lerner Index) measures the degree of market power.

As mentioned above, China's petroleum industry was under the centralized management of China's Petroleum Department before 1980. Due to the open-door policy which was launched in 1979 and the negotiations to join the WTO in 1986, this situation has changed. However, China's petroleum industry always consists of a tightly knit group of collusive monopoly. It is obvious that even though the Chinese government has announced a number of policies to allow foreign access to China's domestic oil market, the Chinese petroleum industry is still in a central planning economy environment. In this case, we are going to measure the degree of market power of China's petroleum industry before and after the open-door policy and China's ascension to the WTO.

The above-mentioned method requires data on prices and marginal costs. However, it is impractical, if not impossible, to get exact information on the production costs of the petroleum industry. To solve this problem, we are going to use the price elasticity of demand to calculate the price-cost margin. Our strategy is to estimate the price elasticity of demand of China's oil industry before and after China's open-door policy and its joining of the WTO. In this way, we can compute price-cost margins without observing actual production costs.

3.1.2 Model structure

According to the regression models of oil demand in the papers by Baldwin and Prosser (1988), Lin (2004) and Huntington (2009), the model should mainly contain variables such as oil prices, GDP, GDP in the previous year, oil demand in the previous year and the exchange rate. We have converted all prices from RMB to US dollars with different-year exchanged rates, so we do not need to consider the exchange rate in our regression. On the other hand, we use only GDP in previous year rather than both current and previous years to avoid endogeneity problems. Firms and individuals make plans ahead, and have future (short-term) energy consumption in current income. In Wong (2009) which is a panel data analysis of the determinants of oil consumption in Australia, the author used world average annual prices of crude oil rather than the Australian domestic crude oil price in his regression. In accordance with this method, we use the Brent Spot Price to replace the Chinese domestic price in our regression. More details about the Brent Spot Price will be provided in the Data section. Therefore, the structure of the model is as follows :

Oil demand function (Q_d):

$$Q_d = \mathcal{F}(P_d, \text{lag GDP}, \text{lag}Q_d, \epsilon)$$

We transform the demand function above into the following regression model and it takes the following form:

$$Q_d = \beta_0 + \beta_1 P_d + \beta_2 \text{laggdp} + \beta_3 \text{lag}Q_d + \varepsilon$$

Where “ Q_d ”, the dependent variable, is annual oil consumption in barrels, “ P_d ” is the annual Brent (Britain) crude oil price converted into US dollars and “laggdp” is the previous year’s gross domestic product converted into US dollars. “lag Q_d ” is the domestic oil consumption in the previous year in barrel. In addition, the demand can also be affected by other abrupt events, both unforeseen and unforeseeable, such as war, the level of conservation and fluctuation of exchange rates. With these disruptions, people might drive less and potential consumers might need less energy even if they are facing the same price level of oil.

In this paper, we use OLS estimation to estimate the value of β_1 which measures sensitivity of consumption to price changes at the margin while holding other variables constant. The corresponding estimated function is

$$Q_d = \beta_0 + \widehat{\beta}_1 P_d + \widehat{\beta}_2 \text{laggdp} + \widehat{\beta}_3 \text{lag}Q_d + \widehat{\varepsilon}$$

It is easy to calculate the mean consumption (in barrel) and mean price (in US dollar). We can get the price elasticity of demand by using the formula:

$$\epsilon_d = \frac{\Delta Q_d}{\Delta P_d} \times \frac{\bar{P}}{\bar{Q}} = \widehat{\beta}_1 \times \frac{\bar{P}}{\bar{Q}}$$

And, as mentioned above:

$$L = \left| \frac{1}{\epsilon} \right|.$$

3.1.3 Data

All data used in estimations are basically drawn from the 2011 BP Statistical Review, China's National Bureau of Statistics and National Development and Reform Commission. The BP data is supplied by the OPEC Annual Statistical Bulletin, the US Energy Information Administration's Annual Energy Outlook and Monthly Energy Review, the Oil and Gas Journal and Petroleum Intelligence Weekly.

We adopt the Brent oil price instead of China's domestic oil price for the following reasons. Firstly, China's oil trade market has been using the Brent oil price as the reference price since the reforms began in the 1980s. Secondly, the Department of National Bureau of Statistics of China does not provide the data for the period between 1965 and 1972 which we need in our regression.

To verify that the Brent oil price is strongly related to China's domestic oil price, we use STATA to test the correlation of these two prices in the period between 1972 and 2009. Firstly, we run a regression with the independent variable of Chinese oil price on the dependent variable of Brent oil price. The sign of the coefficient is positive and its significant at the 5% level. The correlation coefficient between these two prices (0.7907) is quite high for the period 1972-2009. Thus we can use the Brent oil price in our regression.

Table 1: The regression of Chinese domestic price on Brent Oil Price

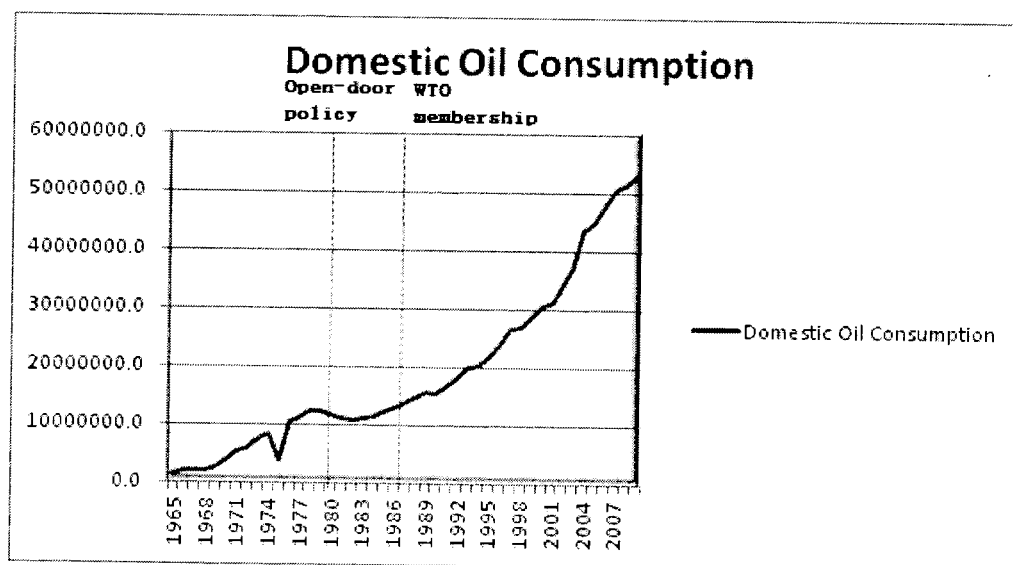
Variable	Coefficient Estimate	Standard Error	T-Ratio	P-Value
Intercept	-1.186105	6.872313	-0.17	0.864
Brent Oil Price	1.291367	0.192437	6.71	0

The GDP data were collected from the National Bureau of Statistics of China (which is the sole data source), but this data might have been edited by the government to meet statistical requirements instead of reflecting the fundamentals of GDP. All the data are converted to US dollars with different exchange rates in each year.

One characteristic of the collected data is that the time period is relatively long. We collected annual data on prices, GDP and consumption from 1965 to 2009. To test the effect of the open-door policy on China's demand for oil, we are going to separate the data into two groups with different periods, before and after the open-door policy began in 1979. We also separate the data into two groups with different periods, before and after China began negotiating to join the WTO to test the effect of WTO membership. We set the boundary in the year 1986 instead of the year 2001 because the effect has been apparent when the Chinese government announced its intention to negotiate to join the WTO in 1986 and China's oil industry started its reform in the middle 1980s. There are obvious changes in the domestic consumption of oil in both 1979 and 1986. In the period between 1965 and 1979, the domestic oil consumption increased slightly. After

the open-door policy started in 1979, the consumption has made a smooth transition to 1986, the year that the Chinese government started to negotiate to join the WTO. After 1986, with the effect of both the open-door policy and WTO membership, domestic oil consumption has dramatically increased till 2009.

Figure 1: Domestic Oil Consumption between 1965 and 2009



source: Statistical Review of World Energy 2011

For checking the stationarity of the data, we run the test in STATA 10. As table 2 shows, the output (Mackinnon p-value) is the calculation of the critical value from tables published by Mackinnon. We can conclude that the coefficient on all variables are not zero, so the series are stationary.

Table 2: The stationarity of data

Time section	Variables	Brent Price	Lagdp	Lag Consumption
1965-2009	1% Critical Value	-3.612	-3.628	-3.628
	5% Critical Value	-2.947	-2.950	-2.950
	10% Critical Value	-2.607	-2.608	-2.608
	Mackinnon p-value for z(t)	0.7563	1.0000	0.9990
1965-1979	1% Critical Value	-3.750	-3.750	-3.750
	5% Critical Value	-3.000	-3.000	-3.000
	10% Critical Value	-2.630	-2.630	-2.630
	Mackinnon p-value for z(t)	0.9972	0.9991	0.8631
1980-2009	1% Critical Value	-3.723	-3.730	-3.730
	5% Critical Value	-2.989	-2.992	-2.992
	10% Critical Value	-2.625	-2.626	-2.626
	Mackinnon p-value for z(t)	0.7744	1.0000	1.0000
1965-1985	1% Critical Value	-3.750	-3.750	-3.750
	5% Critical Value	-3.000	-3.000	-3.000
	10% Critical Value	-2.630	-2.630	-2.630
	Mackinnon p-value for z(t)	0.8412	1.0000	0.6243
1986-2009	1% Critical Value	-3.750	-3.750	-3.750
	5% Critical Value	-3.000	-3.000	-3.000
	10% Critical Value	-2.630	-2.630	-2.630
	Mackinnon p-value for z(t)	0.8007	1.0000	0.9987

3.1.4 Estimation Results

On the basis of the arguments outlined above, we believe that China's oil industry is an oligopoly with considerable market power. We do not expect this market power to have decreased after the open-door policy and China's entry into the WTO.

Now we proceed to examine the regression results. We use the Breusch-Godfrey to test for the presence of autocorrelation. We use the Breusch-Godfrey method because there are lagged variables in the regression. As shown below, we found autocorrelation in the regression and we used the Prais-Winsten transformation to fix the problem.

First of all, from table 3, we can see that the estimated coefficients have the expected signs. The coefficient of P_d is negative and significant, which means the demand for domestic oil decreases as the price of crude oil increases. This matches Australia's case in Wong and Narayan's paper (2009). On the other hand, we can also see that the coefficient of GDP in previous year is negative and very small. That means the previous GDP has a slight effect on the current demand of domestic oil. The coefficient of previous-year consumption is positive and its t-value is very high (30.75). That means the previous domestic oil consumption significantly affects the current oil consumption.

Table 3: Estimated results for the period 1965-2009

(Breusch-Godfrey test: $P=0.0151 < 0.05$, autocorrelation eliminated)

Observation: 44 (1965-2009)								
Variable	Coefficient estimate	Standard Error	T-Ratio	P-Value	Maximum	Minimum	Mean	Median
Intercept	312607.2	383580.5	0.81	0.42				
Brent Price	-39516.72	17653.87	-2.24	0.031	97.3	1.8	23.4	18.4
Laggdp	-0.0000112	0.0000572	-0.2	0.846	4.55E+10	6.97E+08	7.467E+09	3.175E+09
lagconsumption	1.103117	0.035868	30.75	0	51296044	1500682	18316073	13451569
F	2291.85		RHO	-0.37503				
R-square	0.9944							
Durbin-Watson	2.065602							

Now we want to consider the effect of the open-door policy and WTO membership. Therefore, we estimate separate sample groups divided by the events of the beginning of the open-door policy and WTO negotiation.

Table 4: Estimated results for the period 1965-1979

(Breusch-Godfrey test: $P=0.0621>0.05$,no autocorrelation)

Observation: 14 (1965-1979)								
Variable	Coefficient estimate	Standard Error	T-Ratio	P-Value	Maximum	Minimum	Mean	Median
Intercept	-5062296	-1.28E+07	-1.46	0.174				
Brent Price	-241156.5	220655.4	-1.09	0.3	31.61	1.8	7.6	2.48
Laggdp	0.011403	0.0053902	2.12	0.06	2.31E+09	6.97E+08	1.206E+09	1.097E+09
lagconsumption	-0.0554255	0.4056677	-0.14	0.894	12455662	1500682	5662638.9	4549795.4
F	13.77							
R-square	0.8051							
Durbin-Watson	2.410194							

Table 5: Estimated results for the period 1980-2009

(Breusch-Godfrey test: $P=0.3343>0.05$,no autocorrelation)

Observation: 29 (1980-2009)								
Variable	Coefficient estimate	Standard Error	T-Ratio	P-Value	Maximum	Minimum	Mean	Median
Intercept	-644432.2	677798.1	-0.95	0.351				
Brent Price	-23987.49	18325.46	-1.31	0.202	97.3	12.7	31.2	24.7
Laggdp	-0.0000923	0.0000624	-1.48	0.152	4.55E+10	2.82E+09	1.065E+10	6.12E+09
lagconsumption	1.154152	0.0447512	25.79	0	51296044	10927694	24627652	20204638
F	1462.37							
R-square	0.9943							
Durbin-Watson	2.33522							

After eliminating the autocorrelation in the regression, Table 4 shows the regression results for the period before 1979 while table 5 shows the results for the period after 1979. The coefficients of oil price are respectively -241156.5 and -23987.49, both of them are negative as expected. By using the formula of the price-cost margin discussed above, the price elasticity of demand before 1979 is -0.300 and the Lerner index is 3.328. Moreover, the price elasticity of demand after 1979 is -0.0292 and the Lerner index is 34.133. We can notice that the market power of China's oil industry did not decline but dramatically rose after the open door policy started in 1979. This result is consistent with the fact that the three major oil companies currently control more than 90% of domestic production of gasoline and diesel.

We now use the same methods to test the effect of WTO membership.

Table 6: Estimated results for the period 1965-1985

(Breusch-Godfrey test: $P=0.715 > 0.05$, no autocorrelation)

Observation: 20 (1965-1985)								
Variable	Coefficient estimate	Standard Error	T-Ratio	P-Value	Maximum	Minimum	Mean	Median
Intercept	912188.3	1539696	0.59	0.562				
Brent Price	-35540.4	126621	-0.28	0.783	36.8	1.8	14.6	11.6
Laggdp	0.0015065	0.0019341	0.78	0.447	3.11E+09	6.97E+08	1.72E+09	1.52E+09
lagconsumption	0.6723445	0.2498827	2.69	0.016	12455662	1500682	7402455.7	7892223.7
F	21.41							
R-square	0.8005							
Durbin-Watson	2.406212							

Table 7: Estimated results for the period 1986-2009

(Breusch-Godfrey test: $P=0.3212 > 0.05$, no autocorrelation)

Observation: 23 (1986-2009)								
Variable	Coefficient estimate	Standard Error	T-Ratio	P-Value	Maximum	Minimum	Mean	Median
Intercept	-773928.1	969244.3	-0.8	0.434				
Brent Price	-23954.96	26406.36	-0.91	0.376	97.3	12.7	31.1	20.3
Lagdp	-0.0000976	0.0000715	-1.36	0.118	4.55E+10	2.98E+09	1.266E+10	9.416E+09
lagconsumption	1.160491	0.0638027	18.19	0	51296044	13055935	28069874	26452933
F	803.33							
R-square	0.9922							
Durbin-Watson	2.396984							

After autocorrelation elimination, Table 6 shows the regression results for the period 1965-1985. Table 7 shows the regression results using the same estimation method for the period 1986-2009. The coefficient of oil price is -35540.4 in 1965-1985, and -23954.96 in 1986-2009. Both of these two coefficients are negative. Based on the numbers, the price elasticity of demand for the period 1965-1985 is -0.068 and the Lerner index is 14.745. On the other hand, the price elasticity of demand for the period 1986-2009 is -0.026 and the Lerner index is 39.124. We can see that the results obtained in these two periods match the results we got in the previous regression. That is the level of market power in China's oil industry rose following both the open-door policy and entry to the WTO. From the second regression result, we can also see that the market power of

China's oil industry also did not drop but dramatically rose after the Chinese government started its WTO negotiation in 1986.

3.2 Evaluation

Table 8: Summary of the regression results

	Open-door Policy effect		WTO Mebership effect	
	1965-1979	1980-2009	1965-1985	1986-2009
Brent Price coefficient	-241156.5	-23987.49	-35540.4	-23954.96
Mean Price	7.6	31.2	14.6	31.1
Mean Consumption	6113688.0	25572078.2	7633339.8	29106980.4
ϵ	-0.300495	-0.0292972	-0.0678194	-0.0255595
Lerner Index	3.3278978	34.1329187	14.744913	39.1244699

These changes can be understood as follows. Before a number of reforms took place in 1979, China's Ministry of Petroleum had the responsibility to manage the whole petroleum industry including onshore, offshore, upstream and downstream products. The Chinese government controlled everything about the industry at that time. In fact, there was a technical difficulty for the ministry of China's petroleum to manage such a huge production in the whole country. There were many problems inside the ministry including inefficient exploitation, technological difficulties and lack of funds. For example, due to their inefficient exploitation of the main petroleum-producing locations including Daqing, the Chinese have made the serious mistake that they considered these oil fields

would soon run dry. Moreover, due to technological difficulties, they did not exploit the Xinjiang's oil field even though they found it in the early 1970s. These are the reasons why production was relatively low before the open-door policy started in 1979 and the Chinese government decided to focus on innovation in China's oil industry in the early 1980s.

Since the CNOOC was established for taking responsibility for offshore oil administration/production section in 1983 and the CNPC replaced the Ministry of Petroleum Industry in 1988 to manage onshore oil administration/production, the Chinese government started to more specifically control the oil fields by separating them into land-based and sea based. Furthermore, the CNPC was separated into new NCPC and Sinopec which were respectively in charge of the land-based oil field development and petrochemical marketing. That means the Chinese did more specifically control the petroleum products both upstream and downstream. To avoid centralizing tendencies and corruption, the Chinese government restructured the three main oil companies to be holding companies. However, all these companies are state-run companies and they are owned by the Chinese government.

It seems like the Chinese government implemented a number of measures to extend their open-door policy and get ready to enter the WTO. However, the Chinese government was in fact consolidating its control over the oil industry. Since China's economy was significantly modernized in the past 30 years, oil consumption rose dramatically even though the oil price rose dramatically as well. This is the reason why China's oil industry is strongly dominated by the three main oil producers even though the Chinese government has done a lot to increase the degree of freedom in the oil industry after the launch of the open-door policy and negotiation for joining the WTO.

4. Analysis of the effects of the launch of the open-door policy and China's entry into the WTO

In this section, we will present and discuss the short-term and long-term effects of the foreign access to China's petroleum industry.

4.1 Short-term effects

Even though foreign access did not decrease the market power of China's oil industry, the foreign oil majors did have significant impact on that industry, including the improvements and progress not only in the upstream area of exploration development, but also in downstream areas such as purification, distribution and services.

4.1.1 Advancement in the purification field

In fact, the foreign oil majors have started to wade in the Chinese purification field since the middle of the 1990s. For example, in 1996, just a few years after the reform of China's oil industry, the foreign oil majors were in collaboration to establish the Dalian West Pacific PetroChemical Co. with domestic organizations including the China Chemical Import and Export Group and the China Petroleum & Chemical Corporation (Sinopec). This joint-venture began its operations in China's Dalian with processing capacity of 5 million tons per year in 1997. In 2001, the year in which China joined the WTO, the corporation's purification capacity was upgraded from 5 million tons to 8 million tons per year. In addition, this progress was further improved by 2005 to 10 million tons per year. Moreover, the introduction of new equipment has also been moved forward, including 150 tons per year hydrogen analysis equipment and 200 tons per year capacity light oil

hydrogenation refining equipment (Guo, 2010).

Recently, Kuwait Petroleum, a state-run Kuwaiti corporation, was preparing to enter the field of purification in the southern part of China. The corporation was going to construct an oil factory and petrochemical complex with CNPC in the city of Guangzhou. Under this plan, the joint-venture would invest a total of \$5 billion in the oil factory whose crude oil processing capacity would be 15 million tons per year. This plan began in 2008 and would be completed in 2012. (Guo,2010)

Table 9: Entry by oil majors into China's oil purification industry as well as primary joint projects

Company Name	Location	Foreign Investment	Chinese Investment	Capital Amt	Work Content (oil factory)	Crude Oil Processing type	Established (operations)
Dalian West Pacific PetroChemical Co	Dalian	Total (20)	CNPC etc.(80)	\$1.013 billion	8 million t/y	Middle east	1992 (1997)
Sinopec Fujian Oil Products Company	Fujian	Exxonmobil /Aramco (25/25)	Sinopec (50)	\$3.5 billion	4-12 million t/y in up-grades and construction	Saudi-imported	2004 (2008)
Kuwait Guangdong Purification Project	Guang-dong	KPC BP, Shell	CNPC	\$5 million t/y	15 million t/y	Kuwait-imported	2008 (2010)

Sources: Data from CNPC, Sinopec, CNOOC

4.1.2 Advancement in the sales and distribution field

Apart from the purification area, the foreign oil companies, beginning with oil majors, had already entered the Chinese oil industry's sale and distribution field in the latter half of the 1990s and especially since China joined the WTO in 2001. Their target is the Chinese ever-growing oil products market including gasoline, lubrication oil and fuel oil.

Gasoline

As part of the project which is to join oil purification and mineralization, the foreign oil majors such as ExxonMobil and Saudi Aramco were also going to develop the retail sale of oil products and enter the service station operations. Since 2005, after their plans were approved by the Chinese government, ExxonMobil, Saudi Aramco and Sinopec were going to build 700 service stations in Fujian province. The sales in these stations began in 2006 and the oil products were provided by the Fujian Purification and Mineralization Corporation which was also established by those three companies. On the other hand, Shell also established the Sinopec/Shell Jiangsu Petroleum Sale Corporation in collaboration with Sinopec in 2004. This project operated 500 service stations in Jiangsu Province (ExxonMobil Corporation Financial & Operating Review, 2009).

BP was also actively expanding in the area of oil product sales. It established the Oil Products Sale Corporation with PetroChina and operated 45 gasoline stations in collaboration with Sinopec in Zhejiang province. Moreover, BP set up another enterprise called Sinopec/BP Petroleum Ltd with Sinopec to develop 500 service stations in Jiangsu Province and expanded oil product sales in these areas. In the following years, with the cooperation among BP, Sinopec and PetroChina, about 1000 new gasoline stations were established in China's southern coastal region to meet the growing demand in the retail sales in the South Chinese market (BP

China, 2011).

Table 10: Gasoline stations held by oil majors, etc. in China

Corporation	# of Service Station	Partners	Area
ExxonMobil	600	Sinopec and Aramco	Fujian
	500		Guangdong
Shell	500	Sinopec	Jiangsu Sichuan Chongqing
		HaiTian Investment Ltd	
BP	500	Sinopec	Zhejiang Fujian Guangdong
	500	Sinopec Petrochina	
Total	200	Sinochem	4 districts in Beijing
Idemitsu Kosan	1	Chinese Unio Oil	Dalian

Source: Drawn From various materials

There were also other oil majors such as Idemitsu Kosan Co., Ltd (Japan) which have established a number of service stations in different parts of China.

Lubrication Oil and Fuel Oil Sales

At the same time, foreign oil majors also ventured into lubrication oil and fuel oil fields. For example, in 1998, BP, with the collaboration of Chinese Aviation Fuel Oil Ltd, established China's first and only company which was offering jet fuel to 15

airports in southern and central China. China's jet fuel used to be imported from the international market. In addition, Shell also established ZheJiang/Shell Oil Ltd in cooperation with Zhejiang province's Zhuopu Port Corporation. The Zhejiang/Shell Oil Ltd has developed lubrication oil sales operation through its lubrication oil specialty stores in 200 cities in China since 1998. Besides this project, Shell and Sinopec were also planning to build a jet fuel sales network in Beijing, Shanghai, Kunming, Xiamen and Hangzhou. Their future plan was to expand into seven airports: Guangdong, Shenzhen, Chengdu, Nanjing, Changsha, Qingdao and Tianjin (Guo, 2010).

Besides BP, other oil majors such as Japan Energy Corporation have also begun their operation in China's domestic sales market. With the cooperation of Shanxi/Japan energy Lub Ltd and Japan Oil/Mitsubishi, The Japan Energy Corporation did not only manufacture lubrication oil, but also developed local asphalt sales operations. Furthermore, with the cooperation of Sinopec, another Japanese oil major called Nippon Oil Corporation established the Sinopec/Japan Oil (Guangzhou) Lubricant Ltd in Guangzhou in 2010. This corporation produces about 55,000KI per year in high-quality lubrication oil to meet 40% of demand in the southern part of China. It is also planning to expand its operations into other parts of China (Japan Energy Corporation Company Review, 2011).

The oil majors including Shell, BP and ExxonMobil have established over 30 lubrication oil factories in eastern China since 1979. Their production capacity was over 1 million ton per year and accounted for over 22% of the Chinese lubrication oil market while the rest of the market was still controlled by China's big three corporations.

Not only did the foreign oil majors did not only create production facilities with the cooperation of Chinese state-run enterprises, but they also developed the

lubrication oil sales operation by exchanging technology with private corporations. By using this method, those foreign oil majors have successfully grown their market share. For example, ExxonMobil associated with Beijing Unity Petrochemical Ltd, a major private lubrication oil corporation, to provide technological equipment and brand name oil and additives. Moreover, ExxonMobil was also selling high-quality lubrication oil with the cooperation of Henan's Zhengzhou Commercial Trade Ltd in the northern parts of China.

Until now, it is obvious that under the effort of both domestic and foreign corporations, the production and efficiency of lubrication in Chinese oil industry has significantly improved. These are the short-term effects of foreign access after the launch of the open-door policy and China's entry into WTO.

4.2 Long-term effects

Foreign Oil Majors' Strategy for Advancement Into the Chinese Oil Market

After the launch of the open-door policy in 1979, and especially when the Chinese government started to negotiate joining the WTO in 1986, a lot of foreign oil majors have successfully entered the Chinese domestic oil market and contributed to the improvement of China's oil industry. However, most of the upstream and downstream development projects were still led by Chinese national and private enterprises and those foreign corporations just attended as minor partners. For example, as mentioned above, foreign oil majors including Shell, BP and ExxonMobil control only 10% of the domestically produced gasoline and 22% of the Chinese lubrication oil market despite a 30-year long effort. At first glance, it is strange to notice that foreign oil majors were trying their best to enter the Chinese oil market without expecting to generate much profit. Entry into and the development of China's energy market are in fact the first step of

their long-term business strategies. The foreign oil majors have been trying hard to adapt to the "unique market condition" in China such as China's energy market demand, local laws, corporate environment and characteristics of state-run corporations (Guo, 2010).

American and European oil majors

The strategies of the American and European oil majors are very meticulous and long-range. Firstly, they invested in the Initial Public Offering (IPO) and began to move towards entry into Chinese domestic oil market in 1998. At that time, CNPC and Sinopec were reorganized so that they actively progressed into management internationalization, group-formation and the transfer of their assets into stock to tie into foreign capital. With their initial efforts, those foreign oil majors successfully gained an opportunity to enter into China's domestic oil market and steadily pushed forward in IPOs for the Big Three Group. For example, BP was the first to launch the IPO proceeding in New York and Hong Kong stock markets for Chinese oil groups among all foreign majors. They invested \$620 million (20% stake) in PetroChina in 2000, \$400 million (14% stake) in Sinopec in 2000 and \$300 million (20% stake) in CNOOC in 2001. And then Shell invested \$430 million (14% stake) into SinopecCorps in 2000 and \$200 million (20% stake) in 2001 on the two stock markets. Furthermore, ExxonMobil invested \$1 billion (20% stake) in SinopecCorp's in 2000 in the New York and Hong Kong stock markets (Ogutcu, 2002).

Through these manoeuvres, the foreign oil majors were steadily entering Chinese oligopolistic markets which are dominated by the Big Three Groups and wading in developed projects of the oil industry. In that way, the three foreign oil majors attended to the field of exploration development, accelerated and expanded exploration development in CNOOC-controlled waters. On the other hand,

ExxonMobil expanded oil factories and enlarged oil product manufacturing in Fujian with the cooperation of Sinopec. By sharing each other's technology and investment funds, they planned their oil factories to increase production from 4 million tons per year to 12 million tons per year. They were also planning to construct an 800,000 ton per year ethylene plant in Fujian to upgrade the processing capability of Middle East crude oil (ExxonMobil Corporation Financial & Operating Review, 2009).

Secondly, the foreign oil majors also moved to enter into downstream areas such as purification. As the import expansion was increasing year-by-year in order to meet the satisfaction of domestic oil demand, the Chinese government and oil majors were establishing oil factories with foreign oil majors on top of the agreement to guarantees of crude oil processing sources and importation. For example, ExxonMobil and Aramco established oil factories in Fujian with Sinopec and they took charge of crude oil imports from the Middle East. In the future, these two foreign corporation and Sinopec Fujian Oil Products Company are going to jointly invest a total of \$3.5 billion in the expansion of oil factories and the construction of a petrochemical industrial complex (ExxonMobil Corporation Financial & Operating Review, 2009).

Thirdly, we can see that the foreign oil majors have taken a further step that they began to set up projects in cooperation with Chinese private enterprises. Their goal is to work towards gaining management autonomy rights through growth in oil market share. For example, Shell invested about 72 million RMB in 2000 with Haitian Investment Ltd, which is one of largest investing companies in Sichuan province. Moreover, in 2005, the corporation established a gasoline station in Chengdu to tackle the local retail market of oil products. To enter the southwest region, the foreign oil majors such as Shell were trying to make use of private enterprises' local sales networks and personal connections in local government to

develop their market sales. By using the method of joint corporate connections, primarily with private corporations, their strategy is to acquire the management autonomy rather than associating with Chinese corporations in the future. In fact, many other foreign investors and majors are also going to enlarge their sales networks by purchasing local private corporation's service stations.

Finally, the strategy for foreign majors to develop their market sales is to wade in the area of the oil and gas substitution. For example, BP, Shell and ConocoPhillips have been advancing into the area of oil and substitutes in the latter half of the 1990s. By using the method of joint corporate connection, they did not just contribute in the coal bed methane development, but also advanced into the area of coal liquefaction. All these foreign oil majors were aiming to gain profits in Chinese energy operations through the capture of the gas substitute market in the future (Guo, 2010).

Japanese Corporations

Compared to American and European oil majors, Japanese corporations are not large. However, they are still trying their best to develop their petroleum strategy in Asia, especially in China. Japanese oil firms have the advantage of being much closer to China than American and European firms, making it easier for them to manage their corporations and develop their strategies in China. With similar ideas as those adopted by American and European oil majors, the Japanese oil majors have entered into the areas of lubrication oil and asphalt. In the 1990s, the Japanese oil corporations such as Toshiba, Hitachi and Matsushita conducted business development of machine lubrication oil for consumer electronics and cooling machinery in China in response to China's open-door policy and its entry into the WTO. Since investments of Japanese automakers such as Toyota and Honda have grown over the decades, and their participation in local production

also increased since 2001, the Japanese oil corporations established a number of lubrication oil production companies in China's Tianjing and Guangzhou. They are selling the automobile lubricant oils to Japanese auto and part manufacturers in these areas. Since the Japanese corporations are relatively smaller than the American and European corporations, they are trying to step into the energy-related fields such as energy saving in order to gain a competitive edge locally. As Japan's energy efficiency and environmental protection technologies are among the best in the world, the direct investment and transfer of technology in these areas will be a very important part of their market-expansion strategy. (Nippon Oil Corporation News Release, 2009)

5. Future Prospects

The Chinese oil majors are facing heavy pressures from global competition since the launch of the open-door policy in 1979 and China's joining of the WTO in 2001. Due to the concern that the Chinese government would lose its control over the domestic oil industry, especially the retail market and even that domestic oil majors would hardly survive this deathblow and thereby become the dependency of foreign advanced oil industry in the future, it is necessary for the Chinese government to strengthen its control of the domestic oil industry. Facing the challenge from the foreign oil majors, the Chinese government and its oil majors' strategy is to maintain their dominant status in the industry and making the best use of foreign oil majors' better management and technology.

According to China National Energy Strategy and Policy (NESP, FIW Research Reports 2009/10), this strategy contains three main points.

- Making the best use of domestic sources while looking actively for foreign resources of supply.
- maintaining a better balance between supply and demand oriented energy policies; giving priority to energy saving and increasing efficiency.
- Making environmental protection an integral part of the national energy development strategy.

The first point refers to foreign oil policy. If the Chinese domestic oil output remains stable, then consumption and imports will keep on increasing substantially. The dependency might reach 60-70% in 2020, the number would be increased to 80% by 2030 (IEA, 2009). In this case, China's national oil industry will become more and more important.

In addition, as part of the plan which was submitted to the National Work Conference on Energy held in Beijing in February 2009, the government is considering setting up a fund to support firms in their pursuit of foreign mergers and acquisitions. From this plan and the three main points of China National Energy Strategy and Policy, we can see that the Chinese government is willing to continue its cooperation with foreign oil majors. However, Downs (2007) highlights the point that China's political leadership would prefer the domestic majors and foreign oil majors work 'as a team'. That means Chinese government has no plan to increase the freedom of oil operation in China for foreign majors.

According to NESP's view, China's oil security requires the guarantee that domestic demand for oil is met in satisfactory terms with regard to quality, quantity and price. The oil security refers to potential damages to the country's economy due to temporary and abrupt supply cut-offs, broader shortages or price shocks. To ensure oil security, China needs to understand the functioning of the international oil market and corresponding geopolitics. Therefore, NESP suggests that China should use the international oil market rather than domestic market as a major way of getting oil and oil products including future markets. China should also choose different sources of its oil imports with a focus on Russia and the Middle East. On the other hand, Chinese oil majors should invest more upstream since these enterprises have not invested sufficiently upstream, especially in oil exploration abroad. Moreover, a proper mix of competition and alliances should be aimed at, with regard to countries as well as companies. Finally, China should establish a strategic reserve and precautionary system for petroleum to better handle the fluctuations in oil prices and quantities supplied. (China National Energy Strategy and Policy, 2004)

6. Conclusion

The basic finding of this paper is that oil demand and price have been significantly impacted since the launch of the open-door policy in 1979, and China's joining of the WTO in 2001. Compare to Russia which just became the member of WTO in 2011, its oil demand increased from 2.59 million barrel per day in 2001 to 2.74 million barrel per day in 2010, while China's oil demand increased from 4.57 million barrel per day in 1990 to 8.2 million barrel per day in 2010. (Central Intelligence Agency, 2010) The difference of oil demand between these two countries is obvious. An important question addressed in this paper is whether the domestic oil industry will keep its market power in the future. The answer, obviously, is positive. The evidence discussed here suggests that this market power will remain high in the long term. This empirical analysis fits well with the results derived from the models. Comparing the values of the oil demand function in the periods before and after the open-door policy and China's entry to WTO, the price elasticity of demand declines while the consumption dramatically rose.

We have presented the view from China National Energy Strategy and Policy (NESP) that Chinese oil industry will be confronted with a number of big crises in the near future. In the next few years, the Chinese government and oil majors will have to be vigilant against the crises and do their best to strengthen their control in the domestic oil industry.

The prediction that the market power of China's domestic oil industry will not decline in the long run has important implications for where the domestic oil industry will head in the future. The domestic oil industry has gained some advantages from the foreign access after the launch of the open-door policy and entry into the WTO membership. Since crisis is always associated with

opportunities and reforms, the domestic oil industry may eventually occupy a place in the global economy as long as it captures those opportunities and utilizes them effectively.

As predicted and analyzed above, the Chinese economy has been developing dramatically since the open-door policy and the foreign access to the Chinese domestic market in 1979. The Chinese government has to consider both the protection of its domestic economy while making full use of the advantages of foreign entries into its oil industry. After China successfully joined the WTO in 2001, the Chinese government aimed at protecting the petroleum industry since this industry is closely related to both the country's economic development and national defence. In the near future, the success of China's petroleum strategy might directly affect the survival of China's domestic oil industry in its current form.

References

- Baldwin, N. and Prosser, R., (1988). *World oil market simulation*. Central Electricity Generating Board.
- Coleman, J. R., Fry, J. T. and Boughner, D. S., (2002). *The impact of China's accession to the WTO on U.S agricultural exports*. U.S. International Trade Commission.
- Guo, S. Z., (2005). *Oil Refining Business in China*. IEEJ.
- Guo, S. Z., (2007). *The business development of China's national oil companies: the government to business relationship in China*. The Institute of Energy Economics.
- Guo, S. Z., (2010). *Chapter 16: The progression of international oil majors into China: at the heart of the energy market*. Tetsuo Abo (Ed 2010). *Competing Chinese and foreign firms in swelling Chinese economy*. Global Cultural and Economic Research.
- Holweg, M., Luo, J. X. and Oliver, N., (2005). *The past, present and future of China's automotive industry: a value chain perspective*. The Cambridge-MIT institute.
- Huntington, H. G., (2009). *Oil demand and technical progress*. Energy modeling forum Stanford University.

- Koyama, K., (2002). *Oil Market in China: Current Situation and Future Prospects. Studies commissioned to IEEJ by the Agency of Natural Resources and Energy, Ministry of Economy.*
- Lim, T. W., (2010). *Oil and gas in China: the new energy superpower's relation with its region.* National University of Singapore, Singapore.
- Lin, C. Y., (2004). *Estimating annual and monthly supply and demand for world oil: a dry hole?* Department of Economics, Harvard University.
- Liu, K. S., (1998) *The exploitation and development of China's oil and gas (in Chinese).*
- Narayan, P. K. and Wong, P., (2009). *A panel data analysis of the determinants of oil consumption: The case of Australia.* Elsevier Ltd.
- Ogutcu, M., (2002). Foreign direct investment and importance of the "go west" strategy in China's energy sector. OECD global forum.
- Oil and natural gas companies in China: PetroChina, Sinopec and CNOOC. *Facts and Details.*
- Wolfram, C., (1999). *Measuring duopoly power in the British electricity spot market.* American Economic Review (September 1999, p805-826).
- Xinhua Institute, *China cuts oil prices after new pricing mechanism kicks in.* (2009) .

http://english.peopledaily.com.cn/english/200012/05/eng20001205_56947.html
People's Daily.

http://english.peopledaily.com.cn/english/200012/05/eng20001205_56947.html
People's Daily.

www.customs.gov.cn/publish/portal0/tab2453/module72494/page27.htm
General Administration of Customs of the People's Republic of China.

http://docsearch.derrickpetroleum.com/files/00101/Exxon-09Financial%20&%20Operating%20Review_0088.pdf. ExxonMobil Corporation Financial & Operating Review, 2009.

www.noe.jx-group.co.jp/english/press/noc/2009/e71_enpr_090615.html
Nippon Oil Corporation News Release.

www.expressindia.com/fe/daily/19990208/fec08008.html
China may cut jet fuel imports in 1999.

www.bp.com/sectiongenericarticle.do?categoryId=9005207&contentId=7010331.
BP China, 2011.

<http://zhidao.baidu.com/question/143925367>
Baidu Co. Ltd.

www.stats.gov.cn/ National Bureau of Statistics of China

<http://wenku.baidu.com/view/08f3ca82d4d8d15abe234ef6.html>
CNOOC Annual Report-2009.

<http://wenku.baidu.com/view/3994dff3f90f76c661371a44.html?from=related&hasrec=1>

Sinopec Annual Report- 2009.

www.petrochina.com.cn/Resource/pdf/xwygg/2010ndbg.pdf

CNPC annual Report-2010.

www.cia.gov/library/publications/the-world-factbook/fields/2174.html

Central Intelligence Agency