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# INDIAN PETROLEUM INDUSTRY: SOME INSIGHTS USING PORTER'S MODEL

**Siddharth Varma**[1]

[1]International Management Institute, Delhi

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**Abstract:** The purpose of this paper is to understand the competitive environment of the Indian petroleum industry and also to determine the implications of the competitive environment on supply chain performance. The Indian petroleum industry has been analysed by applying Porter's Five Forces Model and its implications on supply chain performance of the industry have been determined. As compared to discrete manufacturing supply chains, process industry supply chains are relatively less researched. Though Porter's Five Forces Model is an old concept its application to the petroleum industry especially with reference to India is new. The insights provided by this paper could be valuable to industry as well as policy makers.

## 1. INTRODUCTION

Process industries are a vital component of any economy. These consist of industries like basic chemicals, petrochemicals, petroleum, fertilizers and pesticides. Process industries transform raw materials into finished products on a commercial scale using a sequence of physical and chemical changes. The transformations are termed as processes and engineered in process plants (Brennan, 1998). The chemical and processing industries provide the building blocks for many products. By feeding industries and the transportation sector the petroleum industry keeps the wheels of the economy moving. Among the process industries, the petroleum industry holds critical importance with both industry and transportation dependent upon it. In a growing economy like India, the significance of this process industry cannot be overemphasized.

The oil sector in India has remained largely in the hands of the Public Sector Undertakings (PSUs). Oil and Natural Gas Commission (ONGC) is by far the biggest player in the oil exploration & production sector and has a presence in refining through its arm-Mangalore Refineries and Petrochemicals Ltd. (MRPL). The major companies in refining are: Indian Oil Corporation Ltd, Bharat Petroleum Corporation Ltd and Hindustan Petroleum Corporation Ltd. Since the opening up of petroleum sector to private sector Reliance and Essar have also appeared as important players in this sector. The Administered Price Mechanism (APM), which meant total control of government on prices of petroleum products, was formally dismantled in April 2002. Subsequent the meeting of the Empowered Group of Ministers in June 2010 pricing of petrol was freed from controls and it was decided that decontrol would also be extended to HSD pricing in due course of time.

However, major products such as Diesel, LPG (Domestic) & SKO (PDS) are still under price control. The way retail petrol prices are revised hints that the government still has some say in petrol pricing and the oil marketing companies continue to absorb a part of the under-recoveries caused by the non-revision of the selling prices.

This paper focuses on the petroleum supply chain with special reference to India and has the following objectives

- To understand the competitive environment of the petroleum industry in India by applying Porter's Five Forces Model.
- To determine the implications of the applying Porter's Model to supply chain performance of petroleum industry in India.

## 2. JUSTIFICATION OF THE STUDY

The present study focusing on the petroleum industry in India is justified due to the following reasons.

- Strong growth potential in India: The per capita consumption of petroleum products in India is much lower than in developed nations and even lower than developing nations like China. With the per capita consumption level in India less than 50% of that in China, a strong growth potential exists in India, given particularly a large population base of over a billion. According to World Energy Outlook 2015, India today is home to one-sixth of the world's population but accounts for only 6% of global energy use and one fifth of the population still lacks access to electricity. A comparison of figures on per capita consumption of different countries is given in Table 1.

***TABLE 2:*** *Per capita consumption of petroleum products*

| Country | Per capita consumption (bbl/day per 1000 persons) |
|---|---|
| **Canada** | 64 |
| **US** | 61 |
| **Germany** | 31 |
| **China** | 7 |
| **India** | 3 |

(Source: CIA World Fact book from www.indexmundi.com)

According to the World Energy Outlook (2015), energy use worldwide is set to grow by one-third to 2040 driven primarily by India, China, Africa, the Middle East and Southeast Asia. Out of this, India contributes about one quarter, the single largest share of growth.

- Petroleum still the major energy source: Despite growing efforts to find alternate sources of energy, petroleum still remains the most widely used energy source not only in India but across the world. The consumption of petroleum products in India is shown in Table 2. Looking at the economic growth of India, the consumption of petroleum products can only increase in future.

- Contribution to resources of Indian government: The petroleum industry in India is also making substantial contribution to the resources of the central and state governments of the country. The contributions during the past three years are given in Table 3.

- Expected change in India due to liberalization: The Indian industry is undergoing liberalization and insights into the industry can help policy makers to make more effective decisions while deciding on policies for the petroleum industry. The implications of applying the model to supply chain performance also need to be understood since liberalization of this industry in India shall require it to be more competitive and supply chain performance

shall be a major factor in deciding the overall performance of any oil firm.

***TABLE 3:*** *Consumption of petroleum products in India (mmtpa)*

| Petroleum Products | 2011-12 (MMTPA) | 2012-13 (MMTPA) | 2013-14 (MMTPA) | 2014-15 (MMTPA) | 2015-16 (MMTPA) |
|---|---|---|---|---|---|
| LPG | 15,300 | 16,986 | 18,363 | 19,675 | 20,857 |
| MS | 14,993 | 16,091 | 17,527 | 19,083 | 20,766 |
| NAPHTHA/NGL | 11,105 | 12,353 | 11,417 | 11,417 | 11,022 |
| ATF | 5,396 | 6,009 | 6,587 | 7,202 | 7,849 |
| SKO | 8,229 | 7,949 | 7,631 | 7,326 | 7,033 |
| HSDO | 64,742 | 65,040 | 68,654 | 72,589 | 76,904 |
| LDO | 415 | 400 | 400 | 400 | 400 |
| LUBES | 2,745 | 2,691 | 2,772 | 2,857 | 2,945 |
| FO/LSHS | 9,232 | 7,954 | 7,902 | 7,899 | 7,872 |
| BITUMEN | 4,628 | 5,254 | 5,541 | 5,732 | 5,971 |
| PET COKE | 6,145 | 6,765 | 7,514 | 8,345 | 9,268 |
| OTHERS | 4,869 | 5,445 | 6,127 | 6,109 | 6,085 |
| Total POL | 1,47,997 | 152,937 | 160,346 | 168,635 | 176,972 |

***TABLE 3:*** *Contribution of oil sector to centre and state ex-chequer (crores of rupees)*

| | **2012-13** | **2013-14** | **2014-15** |
|---|---|---|---|
| **Contribution to central ex-chequer** | 142626 | 152900 | 172066 |
| **Contribution to state ex-chequer** | 136035 | 152460 | 160554 |
| Total | **278660** | **305360** | **332620** |

## 3. PAST STUDIES ON PETROLEUM INDUSTRY

The petroleum industry supply chain is more complex than either the discrete manufacturing supply chains or other process industry supply chains. The petroleum supply chain has certain distinguishing characteristics which set it apart from discrete manufacturing supply chains. Varma et. al. (2007) have tried to identify the characteristics of the petroleum supply chain with special reference to India. The option to trade or exchange crudes, intermediates and products at key points along the chain means that companies have to balance a series of complex and interlinked economic decisions to maximize their margins (Moore, 2005). The environment is dynamic and hence it requires a supply chain that adapts itself to the changes in the environment. Thus, petroleum companies require Adaptive Supply Chains (ASCs) (Tomkins, 2002).

Decision Support for Supply Chains through Object Modeling (DESSCOM) can be used to model supply chains and enable decision-making (Biswas and Narhari, 2004). Operations Research (OR) applications combined with Advanced Planning and Scheduling (APS) systems have been used to develop a vehicle routing and scheduling system (Gayialis and Tatsiopoulos, 2004). Mixed integer linear programming has

been used for scheduling of lube oil and paraffin production (Casas-Liza and Pinto, 2004). Rocha et. al. (2013) have studied the problem in which crude oil is shipped from platforms to terminals using oil tankers at minimum transportation cost and used the concept of Cascading Knapsack Inequalities.

With its own typical characteristics, evaluating performance of the petroleum supply chain may not be easy. Varma et. al (2008) have proposed the use of Balanced Scorecard in conjunction with Analytical Hierarchy Process to evaluate this performance with particular reference to India. A framework for performance based strategies in the oil sector based on a case study of Norwegian oil firms has also been presented (Markeset and Kumar, 2007).

Enyinda et. al. (2011) has used AHP for modeling supply chain risk in a multinational oil firm in Nigeria. Briggs et. al. (2012) has also used AHP for determining risk in the petroleum supply chain. Ji et. al. (2015) apply a structural vector auto regression (SVAR) model, combining the global crude oil market with each emerging economy, to investigate the effects of different types of oil shocks on industrial outputs, real exchange rates, and consumer price levels in each of the BRICS countries.

The petroleum industry faces typical logistics problems, too. In case of oil exploration, there is a known limited storage capacity at the shorebases, on vessels and at the platforms. Vessel size is constrained because of the physical limitations at the shorebases and platforms during the loading/unloading processes. ExxonMobil Corporation outsourced its platform replenishment operations in the US Gulf of Mexico to a division of Baker Energy Corporation (Ross et al., 2007). By training and coordinating the workforce and activities of several local service providers at Penglai 19-3 field in Bohai Bay, on the Northern Sea, ConocoPhillips' largest offshore discovery in China, the *supply chain* manager was able to craft a suite of tailored services that satisfied its core logistic requirements (Hoffman, 2004).

Arora (2015) has studied the oil industry literature to find the tools and techniques used by upstream oil companies for investment decision making. In case of the petroleum industry, one needs to make quick “make versus buy decisions”, seize market opportunities where they exist and optimize the use the company’s physical assets from refineries and terminals to ships and barges (Moore, 2005). This is possible only if timely information is available. Geographical Information Systems (GIS) have become extremely sophisticated and are used for everything from integrity management to emergency response and asset management in the oil and gas industry (Cobbs, 2006). Even purchase of crude oil requires a plethora of information. Apart from price fluctuations, they have to take into account transportation and storage costs. Different refineries produce different products making some of the crudes more suitable than others (Tierney, 2004). A digital pipeline could be developed through the integration of GIS with other systems such as asset management and accounting (Maggio, 2007).

In India, Bharat Petroleum Corporation Ltd (BPCL) has successfully implemented SAP. The major issues in ERP implementation in BPCL were related to choice of vendor, implementation and culture (Ravichandran, 2003). Datta (2009) has studied the supply chain optimization process at BPCL which has been enabled through the Supply Chain Optimisation Department in the organization.

Midttun et. al (2007) have looked at integration of corporate governance with other strategic elements in the North Sea offshore petroleum industry. McSweeney and Worthington (2008) have studied the role of oil as a risk factor in the stock returns in Australia. Edwards (2008) has researched on knowledge management in the energy sector of which petroleum industry is an integral part.

Government regulation has an important role to play in the growth and performance of any industry. Lin (2014) argues that both UK and Chinese governments have sought an increase in tax contributions from the corporate sector in exchange for specific capital investments that will address the challenges of overall decline in domestic oil production and new field exploration. This novel scheme raises concerns for fair competition in the upstream market.

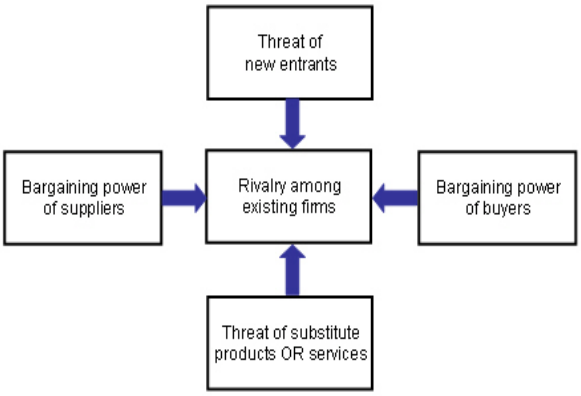
Hokroh (2014) has applied Porter’s Five Forces Model to the global petroleum industry to determine its competitiveness. However, this is

not with reference to any particular country. Based on the literature review it seems that the Porter's Five Forces model has not been explicitly applied to the petroleum industry in India by any researcher.

## 4. SUITABILITY OF USING PORTER'S MODEL

According to Michael Porter, in any industry, the rules of competition are embodied in five competitive forces: the entry of new competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and rivalry among the existing competitors. The collective strength of these forces determines the ability of firms in an industry to earn, on average, rates of return on investment in excess of cost of capital (Porter, 1979). Porter's Five Forces Model is shown schematically in Figure 1.

***Figure 2*** *Porter's five forces model (Michael Porter, 1979)*




The Five Forces model is based on microeconomics. The model allows systematic and structured analysis of market structure and competitive situation. Application of this model will help in better understanding of the competitive position of the petroleum industry by comparing the impact of competitive forces on the organization versus their impact on the competitors. This will help in understanding potential future attractiveness of the industry (Varma, 2008). By understanding the impact of the Five Forces, organizations can develop options to influence them in a way that improves their own competitive position. The model will also help in providing insights into performance issues of the petroleum companies in India. Porter's Model has been extensively used in literature. Selected applications have been given in Table 4.

***TABLE 4:*** *Selected applications of porter's model*

| | **Researcher (Year)** | **Application** |
|---|---|---|
| 1. | Eppinik, D Jan (1987) | Insurance |
| 2. | Fahy, John (1993) | New Europe |
| 3. | Henry, C Michael | Inner city |
| 4. | Kling, James A and | US airline |
| 5. | Dobni, Dawn and | Business schools |
| 6. | Patrick Asubonteng et | Medicare health |
| 7. | Sheppard, Lorraine | Physiotherapy |
| 8. | Clare E Williams, Guy | Leisure industry |
| 9. | Jasimuddin, Sajjad M | Country of Saudi |
| 10. | Siaw, Irene (2004) | Banking industry |
| 11. | Carle, Gian et | Fuel cell cars |
| 12. | Smith, Alan D (2006) | Banking |
| 13. | Vega-Rosado and Luz | Country of |
| 14. | Hopkins, Harold | Robotics industry |
| 15. | Hokroh, Mohammed | Global |

## 5. APPLYING PORTER'S MODEL TO THE INDIAN PETROLEUM INDUSTRY

The Five Forces of Porter's model has been discussed in the following section with respect to the petroleum industry in India.

### 5.1 Entry of new competitors

The following points related to the entry of new competitors in the market are pertinent to the petroleum industry.

- Economies of scale: Economies of scale are important in bringing down average costs of production. In the petroleum industry, the products are functional in nature and profit margins are small. For a new entrant, therefore, economies of scale are particularly relevant in petroleum industry to bring down costs and also to make sizeable profits. This also means that the entrant has to seize

a substantial market share while existing players have to retain customers, in order to utilize economies of scale. Estimated market shares for the major oil marketing companies for the year 2014-15 are: IOCL (43.4%), BPCL (20.2%) and HPCL (18.6%) (http://petroleum.nic.in).

- Access to distribution: In the petroleum industry, the distribution system is an important determinant to successful supply chain management as petroleum products are used by the common man. This can be a time consuming and capital intensive process for a large country like India. The total number of retail outlets in India as on 1.4.2014 were 51870 (http://ppac.org.in). These distribution points have to be well stocked with product throughout the year. Any disruption in supplies can cause panic among the general public. Public sector companies in India have a well established distribution system. For a new entrant putting up such a system will not be easy.

- Government policies: Government policies can play an important role in deciding the entry of competitors. In fact, in India these policies have played a major role in thwarting entry of fresh competitors in the downstream sector of the petroleum supply chain. The Indian government provides subsidies to the Public Sector Undertakings (PSUs). During the year 2013-14, the total subsidies provided for PDS Kerosene and domestic LPG under the Subsidy Scheme, 2002, were Rs 2580 Crore. Subsidy provided on Diesel during 2013-14 was Rs 8.39 per litre. (http;//.ppac.org.in). Such subsidies are not made available to private sector players who suffer a big disadvantage finding it infeasible to compete with the PSUs. The failure of Reliance to enter into the petroleum retail market in a big way many years ago is a glaring example of the effect of government policies on competition.

5.2 Bargaining power of suppliers

The following points related to bargaining power of supplier are pertinent to the petroleum supply chain.

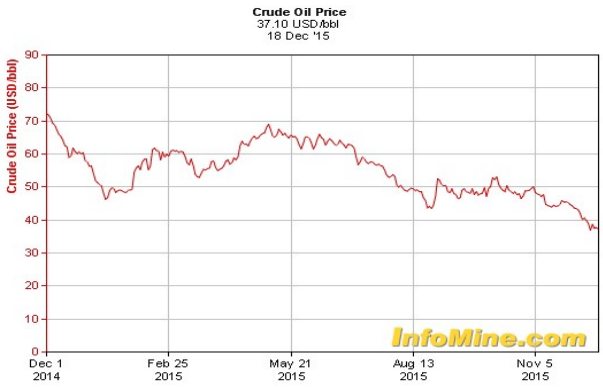
- Differentiation of inputs: The major input to the petroleum industry is crude oil. Crude oils vary from source to source and refining them can produce different composition of light, medium or heavy distillates. Thus, differentiation in inputs plays an important role in the supply chain. The role of differentiated inputs becomes more important because a steady supply of these inputs needs to be maintained for maintaining continuous processing in the refineries.

- Switching costs of suppliers: Switching costs for crude suppliers are small and they can easily switch from one petroleum firm to the other unless there are long term agreements between the two parties involved. This puts them in a strong position vis-à-vis the downstream petroleum firms. This is very relevant to India as the country depends heavily on imported crude. According to a 2013 report of Business Standard, India imports about 79% of its crude oil requirements.

- Presence of substitutes: Petroleum remains the predominant source of energy for the transport and industry sectors. The current Indian government has ambitious plans for renewable energy. According to a Business Standard report (2015), India is aiming to add 175,000 Mw of capacity from clean energy sources by 2022 of which 60 per cent would be from solar energy, 30 per cent from wind and the balance from biomass and small hydro. However, installation of these alternate sources of energy will take time. Moreover, for the transport sector neither of these sources of energy seems to be feasible in the near future. Hence, petroleum products are likely to remain in demand.

- Impact of inputs on costs in the supply chain: In the refinery, crude oil undergoes fractional distillation to produce various petroleum products. Since crude is the major input for the petroleum supply chain its impact on the cost of the supply chain is substantial. In case of India, most of the crude is imported placing it at the mercy of other nations. This factor has tremendous impact on the supply chain costs in India. Crude prices keep fluctuating and this is shown in Figure 2.

***FIGURE 3 Fluctuation in crude oil prices***




(Source: www.infomine.com)

- *Supplier concentration*: Supplies of crude are concentrated within a small group of nations, especially the OPEC countries. The international prices of crude are largely determined be this cartel as they control major portion of crude oil production. Since India is heavily dependent on crude imports supplier concentration puts India in an especially vulnerable position.

5.3 Threat of Substitutes

The following points related to substitutes for petroleum are relevant to the petroleum supply chain.

- *Price performance of substitutes*: Substitutes to petroleum products like solar energy had not been commercially viable for a long time. However, price performance of solar energy is now much better. According to a report by Crisil & PHD Chamber (2015) average solar tariff rates have declined from Rs. 15 per kWh to Rs. 8 per kWh. According to the same report, wind power is now gaining cost parity with conventional energy sources. Moreover, wind-power producers get a generation-based incentive (GBI) of 50 paise/kWh subject to a maximum of Rs.1 crore per Mw over a period of 10 years which is luring them to set up wind power plants. At the moment, the demand for petroleum products shows no sign of diminishing. The picture will become clearer when the government's ambitious plans for renewable energy materialize.

- *Switching costs*: Switching from petroleum products to other forms of energy can be difficult if the equipment is designed to work on petroleum, e.g., in the transport sector. However, for other uses in industrial and domestic sector switching costs are not very high.

5.4 Bargaining power of Buyers

The following determinants of buyer power are relevant to the petroleum industry.

Buyer switching costs: Switching costs for the retail buyer are low as substitute petroleum products from competing firms are freely available in the open market. However, at the moment most of the retail distribution of petroleum products is being done by Public Sector Undertakings. Despite dismantling of the Administered Price Mechanism petroleum prices are still influenced by government and there is little choice for the customer as all the companies' market products at more or less the same price.

At the firm level, as already mentioned, nature of crude can vary from source to source. Even though, various sources of crude do exist, the choice of crude can somewhat limit the freedom of oil refining companies to choose the source depending on the capability of the refinery to refine different types of crude. Hence, bargaining power of downstream petroleum firms for sourcing crude would depend on the refining capability of their refineries.

Brand identity: Brand identity is low for petroleum products in India since these are functional products and downstream petroleum companies have not attempted seriously to differentiate their products. Though firms do attempt differentiation by using additives to improve performance of fuel, such differentiation is quickly copied by competitors nullifying the benefits of differentiation. In the mind of the Indian customer there is little difference between the products sold by the different PSUs.

Impact on performance: The impact of the quality of petroleum products on performance of equipment and vehicles is high. Purity of product is especially significant for optimum performance of equipment. Impure product can not only reduce performance but may be detrimental to the equipment too. Adulteration of product is rampant at retail outlets since these are normally operated by private businessmen and all the PSUs seem to be equally vulnerable to this practice. In India, adulteration of petrol and diesel is a big ticket scam that involves an annual recurring loss of at least Rs 10,000 crore to the exchequer (Ramchandran, 2005).

5.5 Industry rivalry

The following points related to competition within the petroleum industry are pertinent to the petroleum supply chain.

- *Industry growth:* The Indian economy has been steadily growing and demand for petroleum products is increasing to cater to this development. According to a report by Times of India, in the year 2016 India's economy is estimated to grow at about 7.7% outpacing China. Naturally, petroleum industry will also grow in the country. However, the competition is largely limited to the PSUs especially in the downstream supply chain.
- *Intermittent overcapacity*: In terms of the demand for petroleum products within the country, there is excess capacity of refining. However, this is being utilized for producing petroleum products for exporting to other countries. India is a net exporter of petroleum products though it imports crude. However, firms need to be cost competitive in order to export. India's oil refining capacity amounted to 215 MMTPA (Million Metric Tonne Per Annum) in Apr 2014 placing India in the fifth position in the world after the United States, China, Russia and Japan. Total refined crude output was 223 million tons in 2014-15, i.e. over 100% of installed annual capacity (www.knowindia.net). As on 1.4. 2012 India had a total of 23 refineries of which 18 are owned by Public Sector Undertakings, 3 are in the private sector and 2 are joint ventures (https://data.gov.in)
- *Exit barriers*: Being a player in the petroleum industry requires high investments and fixed costs. Once such huge investments have been made exiting the scenario is not easy. In India, exit barriers are high for any industry due to government regulations and this becomes worse for petroleum due to high investments making it unattractive for foreign investors.

Application of Porter's model to the petroleum industry and the resulting implications on performance of the supply chain have been summarized in the Table 5 as in appendix 1.

## 6. ROLE OF GOVERNMENT POLICIES

Government policy is an important component of Porter's Model. The role of government policies in the petroleum industry requires separate mention. Government policies can go a long way in defining the competitive scenario of an industry in a country. This has been the case with India too. Until March 2002, the prices of petroleum products were decided by the government under a system termed as Administered Price Mechanism (APM). The APM was formally dismantled in 2002. Moreover, distribution of petroleum products and exploration are now open to private sector

players. A brief comparison of the situation during pre-reform period with the post reform period has been given in Table 6.

***TABLE 6:*** *Comparison of pre-reform situation and post-reform situation in petroleum industry*

| Area of concern | Situation pre- reforms | Situation post-reforms |
|---|---|---|
| Private participation in distribution | Private participation not allowed. Only the government owned companies had retail outlets. | Private participation allowed. New players, viz, Reliance, Essar and Shell took active interest in setting up retail outlets. But subsidies provided by government on diesel and petrol squeezed their margins and they were unable to compete when crude prices spiraled up. Reliance and Essar closed all their retail outlets during this time. |
| Private participation in exploration | Private participation was allowed but was very limited. | Real encouragement to private sector participation began with the announcing of New Exploration and Licensing Policy (NELP). Auction of oil and gas blocks was done in 2012 during NELP IX. |
| Pricing of petroleum products | Pricing based on cost-plus expenses. No incentive for firms to improve performance. | Pricing supposed to be based on market forces. However, this does not exist. APM has entered through the backdoor in a non-transparent form. |
| Subsidies | Kerosene and LPG highly subsidized. | After dismantling of APM in 2002 it was expected that subsidies would be reduced gradually and then eliminated. However, they still exist. The value of subsidy for 2011-12 for PDS SKO and LPG was Rs 60,349 Crore |

## 7. CONCLUSION

This paper has attempted to gain insights into the petroleum industry to better understand the competitive situation in India. The implications of the competitive forces on the performance of the supply chain have also been enumerated. Petroleum companies need to focus on market share and ensure a steady supply of products and raw material through an efficient transportation system and a geographically dispersed network of retail outlets. Inventory holding costs need to be cut down and crude has to be sourced at competitive prices. This can be done by effective usage of information technology.

From a policy perspective, the government needs to provide a level playing field so that private players can also compete in the market. Administered Price Mechanism needs to be dismantled, both in letter and spirit in order to allow prices of petroleum products to be determined by market forces. Subsidies provided to PSUs need to be eliminated. Only by doing this can the true benefits of liberalization be realized? Also, the government needs to reduce dependency on imported crude by encouraging oil exploration by private companies. All this will help in improving competitiveness of the petroleum industry in India.

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## APPENDIX

***TABLE 5:*** *Application of Porter's model to petroleum industry and implications to the supply chain*

| Competitive force: Entry of new competitors | | |
|---|---|---|
| Determinants of entry | Relevance to petroleum supply chain | Implications for performance of supply chain |
| Economies of scale | Economies of scale are essential in this industry. | Economies of scale can be availed if the firm has adequate market share. Thus, firms need to retain customers and build *market share*. CRM is important. |
| Access to distribution | This is a pre requisite since product is to be sold to the general public. | The distribution system needs to be geographically spread out. The selling points need to have constant supply of product. This requires firms to have a *steady supply of product* and an *efficient transportation* system. |
| Government policies | Indian government provides subsidies to PSUs in order to keep market prices under control. There is cross subsiding of products. Kerosene and LPG are subsidized at the cost of petrol and diesel. | The policy stifles competition since private players are not supported by the government making it infeasible for them to compete in the market. Subsidies must be completely stopped so that *private players get a level playing field* APM has to be completely dismantled not only in letter but also in spirit. This will improve SCM performance. |
| Competitive force: Bargaining power of suppliers | | |
| Determinants of bargaining power | Relevance to petroleum supply chain | Implications for performance of supply chain |
| Differentiation of inputs | Differentiation of inputs exists as different crudes may give different percentage of light, medium or heavy distillates on refining. | The petroleum supply chain requires *constant supply of raw material*. Differentiation in inputs makes the situation more complicated as it limits the available suppliers. Firms need to have long term agreements with crude suppliers but this is difficult due to *highly fluctuating crude prices.* Since India depends heavily on imports this becomes especially relevant. Having refineries capable of refining crudes of different types can make things easier. |
| Switching cost of suppliers | Switching costs for crude suppliers while changing from one petroleum firm to another is small. | Suppliers are in a strong position due to low switching costs. This makes the industry supply chain *vulnerable to crude suppliers.* |
| Presence of substitutes | Though Indian government has ambitious plans for renewable energy it will take time. Commercially | The petroleum supply chain is highly vulnerable to *fluctuating crude prices*. India needs to build *indigenous sources* of crude so that its dependency on imported crude is reduced. |

| | | |
|---|---|---|
| | viable substitutes to crude do not exist for transport sector. India remains heavily dependent on crude suppliers | *Supplies of petroleum products are critical* to the nation. Dependence on imports results in formation of heavy safety stocks. All these three determinants put the crude suppliers in a strong position. |
| Impact of inputs on costs | Crude constitutes a major portion of input cost making the impact substantial. | |
| Supplier concentration | Prices of crude are being controlled by a group of suppliers. | |
| Competitive Force: Substitutes | | |
| Determinants of threat of substitutes | Relevance to petroleum supply chain | Implications for performance of supply chain |
| Price performance of substitutes | Price performance of substitute sources of energy is much improved now. However, products from one oil company can easily substitute products from another company. | Petroleum industry has been in a strong position till now. In the near future, the supply chain shall have to cater to *increasing demand*. This has implications on availability of *raw material, distribution and transportation*. Availability of *renewable sources* might modify the picture. |
| Switching costs | Switching over to other forms of energy in the transport sector is not feasible at the moment. For other uses switching is not difficult. | |
| Competitive Force: Buyers | | |
| Determinants of buyer power | Relevance to petroleum supply chain | Implications for performance of supply chain |
| Switching costs | Switching costs for the retail buyer are low in terms of switching from one oil company to another.<br><br>Switching cost of downstream petroleum companies as buyers of crude oil is relatively high as refineries often are not capable of refining different types of crudes. | Oil companies need to ensure that they are *competitive in terms of cost and quality of product* else they will lose market share. *Customer relationship* becomes very important. Flexibility in refining capability needs to be looked at. |

| | | |
|---|---|---|
| Brand identity | Brand identity is not very important as it is not easy to differentiate on product features. | Purity of product as this is a major issue in the country. Hence, companies can *differentiate on purity*, if possible. Requires more stringent implementation *of testing and control* of product quality at retail outlets. Petroleum companies need to do more in *R & D* to differentiate their product. |
| Impact on performance | Impact of quality of product on equipment performance is high. | |
| Competitive Force: Industry competition | | |
| Determinants of industry rivalry | Relevance to petroleum supply chain | Implications for performance of supply chain |
| Industry growth | Industry growth is high. However, rivalry is largely confined to PSUs. | Growing industry must be accompanied with *policy measures* giving a level playing field to private players fuelling competition and improving performance. |
| Intermittent overcapacity | Overcapacity exists but is utilized for exports. | Firms must be able to compete on *cost and quality* in order to export. |
| Switching costs | Switching costs are low for buyers making rivalry more intense with focus on cost cutting. | Companies need to control costs by *managing transportation and inventories efficiently* and *sourcing crude at competitive prices*. |
| Information complexity | Information complexity is high making use of IT extremely important. | *Extensive use of IT* is required by oil companies to bring about visibility in the supply chain and for *optimizing* the use of resources in a dynamic environment. An *Adaptive Supply Chain* is required. |
| Exit barriers | High exit barriers due to massive investments required in asset creation | *Assets need to be fully utilized* in order to create a high performance supply chain. |

Siddharth Varma
Professor
International Management Institute
E Mail: svarma@imi.edu