Chapter 1

Introduction
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Economic growth is inextricably linked to energy. Energy is required for almost all economic activities. Petroleum, comprising of crude oil and refined petroleum products, is one of the prime sources of energy in the world. To a large degree, petroleum fuelled the rapid post-war economic growth achieved in the OECD (Organization for Economic Cooperation and Development) countries. A few decades earlier, petroleum began to erode coal’s dominance as an energy source; by mid-century (1950s) it had taken over as the preferred fuel in these countries. By the 1970s, petroleum was powering transportation, supplying one-third of industrial sector power and roughly one-quarter of electricity generation in the OECD countries. Petroleum has been playing an increasingly significant role behind the growth story of the non-OECD countries as well. Oil consumption in the developing and emerging non-OECD countries especially India and China now dominates global oil demand growth.

However, the central problem that nations worldwide have consistently been facing is that this crucial non-renewable energy resource is scarce and is concentrated in a few countries/regions of the world. The surplus production capacity of petroleum is largely concentrated in the Middle East and West Asia. This imbalance in distribution has serious implications on the growth as well as energy security of the countries that are not self-sufficient in terms of indigenous production of petroleum and are largely dependent on imports from the aforesaid regions to fuel their economies. The oil crisis of 1973-74 bears ample testimony to the severity of the problem underlying this imbalance in supply of oil.

Coming to India, although the petroleum industry of the country is one of the oldest, India is one of the least-explored countries in the world. In 2005-06, the balance recoverable reserve of crude oil in India stood at 786 million tonne and the annual production of crude oil was only around 33 million tonnes. The annual demand in that year, however, was more than 130 million tonne, thereby calling for huge imports of

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2. In India oil was discovered at Makum near Margherita in Assam in 1867 nine years after Col. Drake's discovery in Titusville (Pandian, 2005).
crude. In fact, given the burgeoning growth in oil consumption attributable to the rapid growth of the Indian economy post-1991, coupled with supply-side constraints, such as insignificant domestic supply of crude (attributable to a stagnating domestic production), low reserve accretion and inadequate availability of appropriate substitutes, among other factors, made India emerge as a major net importer of oil.

India has persistently been depending on imported crude oil (primarily from the oil and petroleum exporting countries in the Middle East) to meet the lion’s share of its requirement. The import dependence for crude and the consequent vulnerability of the country to oil price shocks has exacerbated over the recent past owing to rapid growth of the Indian economy post-1991 that has fuelled a rapid growth in oil consumption.

Given the paramount importance of petroleum for the Indian economy and its increasing import dependence on this front, domestic pricing of crude oil and petroleum products assumes enormous significance for the country. The pricing regime not only influences the cost of energy for the economy as a whole but also has significant implications on economic growth and welfare. A close look at the pricing regime in the petroleum sector in India reveals that for nearly two and half decades (from 1975 to 1997) the petroleum sector in the country was operating in a state of complete protection under Administered Pricing Mechanism (APM). It is only in 1998 that the sector embarked on a gradual transition to a regime of deregulation and open competition.

The pricing of crude and petroleum products in the country has been influenced by a multiplicity of politico-economic factors and (oft-contradictory) interests of various actors and interest groups involved in the matrix, such as the consumers, particularly the vulnerable sections; the producers; refiners; marketing companies; and the government. However, before one delves into an analysis of determination of domestic pricing of crude oil and petroleum products in India it is imperative to understand the functioning of global crude oil market. An in-depth analysis of the functioning of global crude oil market assumes particular significance for India, given the extent of its import dependence especially on the OPEC (Organisation of Petroleum Exporting Countries),

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3 The Organization of the Petroleum Exporting Countries (OPEC) is a permanent, intergovernmental organization, created on September 10–14, 1960, by Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. The
the single largest global oil producing entity, for its crude procurement and the consequent vulnerability of the country on the oil front. In fact, the significance of the developments in the global crude oil market for India has been further re-inforced by the onset of the gradual dismantling of the APM in late-90s, which has made the economy, in general, and petroleum sector, in particular, more sensitive to the global crude price movements. The study therefore begins by exploring the working of the global crude oil market.

A central issue that has been extensively debated in the literature dealing with the determination of the global crude oil prices is the stakes of the OPEC in the global crude oil market. In the conventional energy modelling systems, such as the one followed by the National Energy Modelling System (NEMS), USA or International Energy Agency (IEA), Paris, the OPEC has been assumed to act like a residual producer. In other words, the OPEC is assumed to produce the amount that is being demanded from it (often referred to as ‘Call on OPEC’), after accounting for supply from Non-OPEC (i.e. rest of the world) and stock adjustment from the total world demand for crude oil. Notwithstanding such assumptions in the aforesaid models, the OPEC’s role just as a residual producer continues to remain an open question. In fact, this issue has turned out to be the focus of an intriguing debate in the literature dealing with global crude oil market. Several questions have been raised against the aforesaid conjecture. First, OPEC is not a homogeneous entity but consists of producers with diverse proven reserve position and hence diverse interests and expectations. So, it would be rather naive to expect that the OPEC as a whole would comply with the call without taking into account the interests of its member countries. Although the production quota of the OPEC is decided after taking into account the ‘Call’ but a tendency to defect or cheat especially...

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five Founding Members were later joined by nine other Members: Qatar (1961); Indonesia (1962); Libya (1962); United Arab Emirates (1967); Algeria (1969); Nigeria (1971); Ecuador (1973) – suspended its membership from December 1992-October 2007; Angola (2007) and Gabon (1975-1994). OPEC had its headquarters in Geneva, Switzerland, in the first five years of its existence. This was moved to Vienna, Austria, on September 1, 1965.

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Proven reserves are estimated quantities that analysis of geologic and engineering data demonstrates with reasonable certainty are recoverable under existing economic and operating conditions. The proven reserve of OPEC for 2007 was around 939016 million barrels which is around 78 percent of the world proven crude oil reserves.
among members with lower reserves has been observed to be quite common within the OPEC. With the aim of amassing large and quick profits, the OPEC members with lower reserves have often been found to have overproduced when prices were on the higher side, thereby violating the quota decided well in advance in the OPEC meetings. Against this backdrop, a model of world demand and Non-OPEC Supply has been constructed in Chapter 2 to cross-examine whether the assumption of the conventional modelling approaches regarding the OPEC’s role as a residual producer actually holds good in practice. The chapter further explores, by using time series econometric techniques [namely cointegration (for long-run elasticity) and Vector Error Correction Model (for short-run dynamics)], possible impacts of the capacity utilisation of the OPEC on the global price of crude.

Chapter 3 builds a model of demand for crude oil for India and China in line with the world crude demand model constructed in Chapter 2. While the focus of the Thesis is predominantly on India, it was felt that a comparative analysis of India and China would bring to the fore significant insights on the relative-vulnerability and energy-security status of these two emerging economies of Asia, both of which have come under increasing global scanner owing to their burgeoning energy consumption and the concomitant emissions of green house gases (GHGs). With this aim in view, Chapter 3 explores the long-run elasticity of demand with respect to oil prices for both the countries.

Having explored the global crude oil market scenario as well as the vulnerability of India to world crude prices, Chapter 4 provides an in-depth account of the domestic pricing regime for crude and petroleum products in the country. As mentioned earlier, till 1997-98 the petroleum sector was operating under Administered Pricing Mechanism (APM). This mechanism was based on the concept of retention price, according to which refiners were allowed to retain, out of their sale proceeds, cost of crude, refining cost and a reasonable return on investment. The same mechanism was extended to marketing and distribution companies. The Government of India was also fixing the prices of finished products and the returns of oil companies were de-linked from the price at which the goods were finally sold. In other words, the pricing mechanism shielded the upstream (exploration and production) as well as downstream (refining and marketing) oil
companies in public sector from any international crude price fluctuation. Moreover, there was little or no symmetry between the movement of global crude and domestic petroleum product prices. The insulation of oil producers, refineries and marketing companies from international price fluctuations, however, failed miserably to create a globally competitive oil industry and also failed to generate sufficient incentive to invest more on risky exploration and development ventures and garner adequate resources for infrastructure development in both the downstream and upstream sectors. Against this backdrop, Chapter 4 analyses in deeper details the working of the APM in India since its inception explaining its evolution, functioning and the rationale for dismantling. The discussion and analysis in the chapter relies mainly on data and information gathered from reports of various committees that have been formed by the Government of India in the post-independence era to analyse the working and determination of the petroleum pricing system in India.

With a view to encourage private participation and generate incentives for investment in the petroleum sector the process of deregulation finally began in 1998. Immediately after dismantling of the APM, a new methodology for price determination, called import parity pricing, had been introduced in 2002 for crude as well as refined products. Import parity pricing reflected the price in the domestic market as if the crude or products were actually imported and thus involved addition of notional costs, such as ocean freight, insurance, customs duty, ocean loss, port dues, among other things, to the FOB (Free-on-Board) price of crude or products respectively in the international market. Thus, the retail selling prices of petroleum products were based on this notional price at which these products would have been imported into the country and not on the basis of actual ex-refinery price of these products which could correctly reflect upon the actual cost of refining. This methodology, however, came under serious scrutiny due to undue rent that it was providing to the upstream and downstream oil companies and was eventually replaced with trade-parity price for the products.

Another important issue that deserves a special mention in this context is that even after dismantling of the APM four sensitive products continued to be subsidised and shielded from international crude price rise due to political and social compulsions, as claimed by the government. These are petrol (gasoline/motor spirit) and diesel (high speed diesel) -
that are primarily used as automotive fuel; LPG and kerosene (superior kerosene oil) -
that are primarily used for household consumption. Using data from Petroleum Planning
and Analysis Cell (PPAC) of the Government of India if one considers the changes in
crude and refined petroleum product prices for the period January 2004 to June 2008, it
could be observed that the prices of the benchmark crude (i.e. UK Brent) increased by
nearly 344 per cent. During the same period the prices of refined petroleum products at
important global hubs increased by 257 to 284 per cent for gasoline (petrol or motor
spirit), by 333 to 364 per cent for diesel (HSD) and by 339 to 370 per cent for kerosene.
The price increase of LPG (propane) was around 190 to 200 per cent. In sharp contrast to
the aforesaid figures, during the same period the retail selling prices of petrol in Delhi
(considering Delhi as a benchmark for India) increased by just 50 percent from Rs. 33.70
to Rs. 50.56 per litre, while the price of diesel (HSD) increased by 60 percent from Rs.
21.73 to Rs. 34.80 per litre. While the price of PDS Kerosene remained virtually
unaltered during this period, the price of domestic LPG was raised by a meagre 44
percent. Considering in terms of end-use, kerosene is used for lighting purpose as well as
cooking purpose in rural areas. However, in urban areas the usage of kerosene is minimal
and is mainly used for cooking purpose. LPG is mainly used as an urban cooking fuel
and its penetration in the rural areas is insignificant. Due to its very low price, kerosene
has often been used for purpose of adulteration with other fuels. Similarly LPG meant for
cooking purpose in households recently began to be diverted for usage in automobiles.
As regards automobile fuels, although prices were supposed to be completely dismantled,
this has not happened in practice. The artificial deflation of the price of automotive fuel
i.e. petrol and diesel even after deregulation has been defended by the government on the
ground of poverty/social compulsion. The issue has, however, been extensively debated
as the usage of these fuels are highly skewed towards urban metropolises and are
primarily used by the vehicle owners (cars and two wheelers), who belong to the
relatively richer section (not poorer) and includes mostly the aspiring middle class with a
high propensity to travel. At the same time the universal subsidy on LPG, whose
penetration has been least in the poor rural areas and has been used mainly as an urban
cooking fuel, has also been widely contested. A number of government committees have
also questioned the use of petroleum sector as a haven for collection of tax revenue by
the exchequer creating a distortionary impact on pricing both to the disadvantage of the
final consumers as well as producers to a considerable extent. In the light of the
significance of all these issues in the present context of pricing of petroleum products in India, Chapter 4 further explores how both crude and petroleum products are being priced after dismantling of the APM with an in-depth examination of both the taxes on crude and petroleum products and subsidies meant for sensitive petroleum products along with their intended or unintended consequences. The analysis relies on data and information gathered from Petroleum Planning and Analysis Cell (PPAC) of the Ministry of Petroleum and Natural Gas, Government of India, as well as on the reports on pricing of crude and petroleum products submitted by various committees, which includes, among others, Rangarajan Committee on Pricing and Taxation of Petroleum Products, Parliamentary Standing Committee on Pricing of Petroleum Products and the more recent B.K. Chaturvedi Committee on Financial Position of Oil Companies.

The asymmetry that historically exists in India in the auto-fuel prices on account of artificial deflation of diesel relative to petrol, even after dismantling, coupled with a conducive policy for private vehicle ownership; absence of adequate sound and attractive public transportation; lack of integration of land-use planning and infrastructure, have only led to flooding of Indian roads with cars and two wheelers and have not encouraged conservation by any means. The improvement in vehicle technology and fuel quality have been largely offset by the sops on fuel prices and prices of vehicles that continued to provide a constant fillip to higher rate of ownership and utilisation of personalised vehicles leading to higher energy consumption and exacerbation of negative spill-over on the environment- both locally and globally. In India, transport is the largest consumer of oil and ranks only next to the electricity and heat generating sector in terms of CO2 emissions and hence requires crucial policy intervention. Against this backdrop, Chapter 5 builds up a derived demand model of automotive fuel based on time-series econometric estimation of Traffic Volume per Vehicle (TVPV) and per capita vehicle ownership. Various scenarios have been constructed based on assumptions about fuel prices and fuel efficiency and have been compared with respect to business as usual scenarios to assess the amount of energy that could be potentially saved and CO2 emissions that could be potentially averted through conservation (encouraged by elimination of cross-subsidy and asymmetry in fuel prices) and progressive improvement in fuel burning efficiency.

Chapter 6 concludes the study with a set of policy recommendations.