Diesel Pricing in India: Entangled in Policy Maze

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List of Acronyms and Abbreviations Used

^{0}C: Degree Centigrade

AG: Arab Gulf

APM: Administered Price Mechanism

ASCM: Agreement on Subsidies and Countervailing Measures

ASI: Annual Survey of Industries

ATF: Aviation Turbine Fuel

bbl: Barrel

BS: Bharat Stage

C&F: Cost and Freight

CACP: Commission for Agricultural Costs and Prices

CENVAT: Central VAT

CIF: Cost, Insurance and Freight

CNG: Compressed Natural Gas

CoI: Cost of Inputs

COPE: Crude Oil Price Equalisation

DC: Dealer Commission

DFID: Department for International Development

E&P: Exploration and Production

ECoSFM: Empowered Committee of State Finance Ministers

EPP: Export Parity Pricing

ERP: Effective Rate of Protection

FCO: Foreign and Commonwealth Office

FO: Furnace Oil / Fuel Oil

FOB: Free on Board

GDP: Gross Domestic Product

GoI: Government of India

GSI: Global Subsidies Initiative

GST: Goods and Services Tax

GVA: Gross Value Added

HSD: High Speed Diesel

IISD: International Institute of Sustainable Development

incl.: including

INR: Indian Rupee

I-O: Input-Output

IPP: Import Parity Pricing

JWG: Joint Working Group

kl: kilolitre

km.: kilometre

kmph: kilometres per hour

kmpl: kilometres per litre

LC: Letter of Credit

LPG: Liquefied Petroleum Gas

LSHS: Low Sulphur Heavy Stock

ltr: Litre

MDI: Management Development Institute

MDPM: Market Determined Pricing Mechanism

MOP&NG: Ministry of Petroleum and Natural Gas

MoSPI: Ministry of Statistics and Programme Implementation

MS: Motor Spirit

MSP: Minimum Support Price

NCAER: National Council of Applied Economic Research

NDA: National Democratic Alliance

NIC: New Industrial Classification

NIPFP: National Institute of Public Finance and Policy

OCC: Oil Coordination Committee

OCRC: Oil Cost Review Committee

OECD: Organisation for Economic Cooperation and Development

OMC: Oil Marketing Companies

op. cit: previous citation

OPC: Oil Prices Committee

PDS: Public Distribution System

pp: particular page

PPA: Product Price Adjustment

PPAC: Petroleum Planning and Analysis Cell

RBF: Refinery Boiler Fuel

RBI: Reserve Bank of India

RoCE: Return on capital Employed

RSP: Retail Sale / Selling Price

RTP: Refinery Transfer Price

SAP: State Advised Price

SKO: Superior Kerosene Oil

SRTC: State Road Transport Corporations

TPP: Trade Parity Pricing

TSR: Three-Seater Rickshaw

UK: United Kingdom

UNDP: United Nations Development Programme

USA: United States of America

USD: United States Dollar

VAT: Value Added Tax

VoO: Value of Output

WHO: World Health Organisation

WPI: Wholesale Price Index

WTO: World Trade Organisation

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Executive Summary

Multi-pronged initiatives are envisaged for the *India: Hydrocarbon Vision-2025* with principal objectives to (a) ensure oil security, (b) improve customer service, (c) develop a competitive industry, (d) enhance quality of life, and (e) assure energy security.

The essential policy ingredients to affect these objectives relate to (i) exploration and production, (ii) external policy and oil security, (iii) natural gas, (iv) refining and marketing, (v) tariff and pricing, and (vi) restructuring and disinvestment (*Section 3*).

The elements of tariff and pricing policy intend to (a) promote new investment with adequate protection to domestic producers, (b) incentivise environment friendly behaviour and encourage cleaner, greener, and quality fuels, (c) balance the need to boost government revenues with the need to align duties with Asia-Pacific countries and aligning prices to international levels, and (d) remove subsidies and cross-subsidies to promote efficient utilisation and eliminate adulteration.

The identified specific actions include (i) phasing out existing subsidies as early as possible, (ii) determine appropriate levels of tariff and duties, (iii) transfer subsidies to the budget, and (iv) increase linkage of natural gas consumer price to near 100 per cent import parity with fuel oil.

This report is a modest attempt to track developments that affect the intent of tariff and pricing policy, especially for diesel. It is however, not feasible to narrow-down focus entirely on diesel or on to all aspects concerning diesel alone.

The report identifies areas where significant progress has been achieved and certain policy intent may have already been served. It highlights areas that require greater emphasis than currently applied, but more importantly it deciphers actions that may require a course-correction for realignment with the vision.

While India imports almost four-fifths of its crude-oil needs, the currently installed refining capacity already exceeds its domestic consumption demand for petroleum products. The proposed and nearing-completion capacity addition in refining is likely to increase excess capacity (even after accounting for rising domestic consumption).

With most capacity expansion occurring over the last two decades, India is equipped with relatively new and state-of-the-art technology in its refineries. It has also emerged as a competitive exporter of certain refined products, particularly diesel. Thus India appears to have made substantial progress with the first key element of tariff and pricing policy, namely to promote new investment.

Until recently, success though has been largely confined in the downstream activities. Even here, there continues to be sharp compartmentalisation with public sector oil marketing companies (OMCs) catering to domestic consumers and exports being catered by private-sector refiners.

An additional advantage with this (relatively recent) capacity expansion in refining has been a quicker move towards improvement in standards of fuel quality (even comparable to several advanced and rich nations). In turn this has enabled significant progress with a second key element of pricing policy namely, adoption of cleaner, greener, and quality fuels.

Limited progress can also be noted on a part of the third key element of tariff and pricing policy that relates to alignment of duties with Asia-Pacific countries. The taxation policy of petroleum products has successfully protected government revenue (*Table 8, Section 4.2*).

Almost 80 per cent of total tax revenue from the petroleum sector is contributed by taxes on crude, motor spirit (MS or petrol or gasoline), aviation turbine fuel (ATF), and high speed diesel (HSD or diesel or gasoil). Taxes on these four items are not integrated with the extant variant of the value-added tax system adopted in India.

Complete implementation of a system of taxation of value-added, encompassing most (if not all) goods and services (and including the currently excluded petroleum products) should provide a boost to economic activity and thereby boost government revenue. This could enable further progress along the third key element.

Some progress could also be claimed on the policy part concerning the rise of prices to international levels. But, the fourth key element of tariff and pricing policy appears as a red-herring in what would otherwise pass as an acclaimed success story in Indian policy making. This fourth element concerns removal of subsidies and cross subsidies to promote efficient utilisation and eliminate adulteration.

Fiscal subsidy in the federal government budget relates to domestic liquefied petroleum gas (LPG) and public distribution system (PDS) kerosene ostensibly targeted as cooking and (rural) lighting fuels respectively. There is also a small element on freight subsidy for far-flung areas.

A flat rate of Indian rupee (INR) 0.82 per litre for PDS kerosene and INR 22.58 per cylinder (14.2 kg) for domestic LPG, constitute the fiscal subsidy since 2004-5. The total fiscal subsidy (including freight subsidy) was INR 26.8 billion in 2005-6 and reached INR 30.2 billion in 2011-2.

But there is a huge and rising element of under-recovery of the OMCs on account of sale of sensitive petroleum products namely, MS, HSD, domestic LPG and PDS kerosene. Under-recovery is essentially the difference between a desired price (based on international prices and other cost elements) and the actual (depot) price charged to dealers. This was estimated at INR 1385.4 billion in 2011-2, which is almost 46 times the fiscal subsidy for that year (*Table 7*).

Sale of diesel accounted for close to 59 per cent of the under-recovery in 2011-2. On a per litre basis, extant under-recovery on diesel is about 25 per cent of RSP in Delhi.

Diesel constitutes 38 per cent of all petroleum products consumption in India. Given the profile of uses and users of diesel, currently its substitution possibilities appear to be severely circumscribed (*Figure 1*, *Table 4*).

It is used as an input in activities that together account for almost 40 per cent of gross domestic product (GDP) (*Table 1*). But, almost 65 per cent of diesel is used in transportation activities that contribute to 6.6 per cent of GDP.

Road-transportation services constitute more than 70 per cent of GDP from transport services. Diesel sold from retail outlets located along national and state highways constitute more than three-fifths of all retail sales.

Operation of trucks uses more than one-half of diesel consumption for transportation. Although, railways consume around one-fourth as much diesel per net tonne-kilometre as trucks, the ratio of rail to road in passenger traffic stood at 15:85, and in freight traffic at 30:70.

Glacial change in railway infrastructure is likely to push the increase in freight on to roads and the share of road transport may rise to 85 per cent (from 70 per cent). Unless road-infrastructure is improved, average speed of road-transit may decline and worsen aggregate diesel-use efficiency.

Although targeted as a fuel for (rural) lighting, PDS kerosene provides for poor illumination and an 'inferior' good for such use. However, being a middle distillate like diesel, and at almost one-third the price per litre of diesel, it provides a huge opportunity for diversion in use and adulteration with diesel (*Table 6*).

The wide wedge in retail prices between (a) the higher taxed but less efficient MS, and (b) the lower taxed but more efficient HSD, has hardly helped in improving the balance in resource utilisation (*Figure 2*, *Table 6*).

Reform in pricing of diesel thus appears to be the single most critical element in addressing the fourth key element in the national policy relating to tariff and pricing of hydrocarbons.

The chronology of pricing policy is presented in *box 1*. The extant policy on diesel, as recommended by Rangarajan Committee (2006) and later endorsed for continuation by Parikh Committee (2010), is termed as trade parity pricing (TPP). This gives 80 per cent weight to import parity price (IPP) and 20 per cent weight to export parity price (EPP) of diesel.

The EPP is the free on board (FOB) price of *Bharat* stage (BS) III equivalent diesel at Arab Gulf, converted into INR per litre at the prevalent INR per US dollar exchange rate. The IPP includes three more (than EPP) elements namely, (ocean) freight, insurance, and customs duty (*Table 5*).

TPP has weak theoretical grounding. Inclusion of customs duty in IPP apart from offering unwarranted protection is inconsistent with the notion of international prices. The IPP could be the cost, insurance, and freight (CIF) price. A higher weight on IPP is particularly inadmissible when India is emerging as a competitive producer of refined products. Thus, FOB price or EPP is the appropriate benchmark for setting domestic prices.

In the extant practice, TPP however is the basis only for a 'desired' price. The actual retail sale price (RSP) of diesel (including its components) is completely policy determined. The components of RSP are (i) 'depot' price which is the price charged to the dealers, (ii) excise duty on the depot price, charged by the federal government, (iii) dealer commission, and (iv) sales tax on the sum of i, ii, and iii, charged by the provincial government.

Under-recovery per litre of diesel sold, estimated as the difference between the desired price and depot price, then may fluctuate due to variation in the (i) FOB price at Arab Gulf and (ii) prevalent exchange rate.

Comparing between *table 5* and *appendix C* reveals that despite negligible change in dollar denominated (FOB) price (as on 16th November, 2011 and 16th May 2012), under-recovery per litre of diesel had increased from INR 10.17 to 13.64. A 34 per cent increase from a sharp depreciation in INR / USD exchange rate.

Most governments, anywhere in the world, would find it difficult to let RSP of diesel to adjust so sharply. Only four per cent of diesel is used for final consumption with remainder 96 per cent for intermediate use. Limited technological substitution possibility, in the short to medium term, could be inhibiting in a developing economy like India.

Given the extant weight of diesel in WPI, a 10 per cent increase in its price would raise the price level by 0.47 per cent. A 25 per cent increase would therefore be commensurate with a price level rise of 1.2 per cent.

But, a simple exercise to estimate input of diesel and the impact of a 25 per cent increase in its price suggests, that *ceteris paribus* total costs would rise by 8, 10, 3 and 0.25 per cent respectively for (i) passenger transport in public sector, (ii) freight transport by road, (iii) railway transportation service, and (iv) industry.

Under very broad assumptions for use of diesel in agriculture, a 25 per cent increase in its price would raise cost of cultivation of wheat and sugarcane respectively by 2.75 and 0.75 per cent.

Given this variation in input cost increase, practitioners of Indian macro-economic management often worry about a strong tendency of the actual price level to overshoot (the expected 1.2 per cent increase in price level from a 25 per cent increase in diesel price), resulting in disproportionately higher inflation.

However, it is equally true that governments in India would be ill-advised to completely insulate domestic consumers from the vagaries of international prices. The net effect of an

attempt to hold domestic prices may cause (i) a decline in revenue yield (if taxes and duties are reduced to dampen the impact) or, (ii) a rise in expenditure on account of a subsidy.

This, in the short run, would result in a rise in fiscal deficit. But more importantly, misallocation of resources may adversely impact prospects for growth and employment in the medium to long-term.

As is the extant practice, the government may opt to defray only a part of the under-recovery for the OMCs. This impinges on the profitability of OMCs and in the long run, availability of investible surplus.

Under-recovery on diesel (INR 13.64 per litre) is higher than the taxes realised from its sale (INR 7.66 per litre) (see *table 6*).

Apart from the usual fiscal deficit induced inflation due to a subsidy on diesel, a more serious public finance issue may be brewing due to relatively higher taxation of petrol. Put differently, this may also be seen as a cross-subsidy.

Indirect tax yield from sale of a litre of diesel is less than 30 per cent of that from the sale of a litre of petrol (INR 7.66 from a litre of diesel compared to INR 26.64 from a litre of petrol, *Table 6*).

Rising 'dieselisation' of the economy, due to slow (or no) revision in diesel prices would require sharper increases in taxation of petrol to maintain neutrality in government revenue. But, if this strategy is continued then this may only accelerate dieselisation (and thus killing the hen that lays the golden eggs).

Efficiency of diesel on average is 30 per cent more than petrol. Tax policy should be such that it is commensurate with this (efficiency) differential (petrol may be taxed 30 per cent higher than diesel) or, *vice-versa*.

It is desirable to harmonise petroleum sector taxation with the proposed goods and services tax (GST) in the framework of a tax on value-added. This move would not only help widen the base of taxation, but also reduce the heavy reliance of both federal and provincial governments on petroleum sector taxes.

There may be other grounds for difference in taxes on diesel and petrol based on emission (harmfulness) externality. But, these should be based on an output measure (emissions per ton-km) rather than as a pure input measure (emissions per litre).

These *green taxes* could be levied as an additional rate, over and above the *normal* rate of taxation in a VAT framework. However, while the normal rate would be eligible for input-tax credit, the additional rate would be non-creditable.

The measures proposed in this report are in consonance with the spirit of the tariff and pricing policy as envisioned in the *India: Hydrocarbon Vision-2025*.

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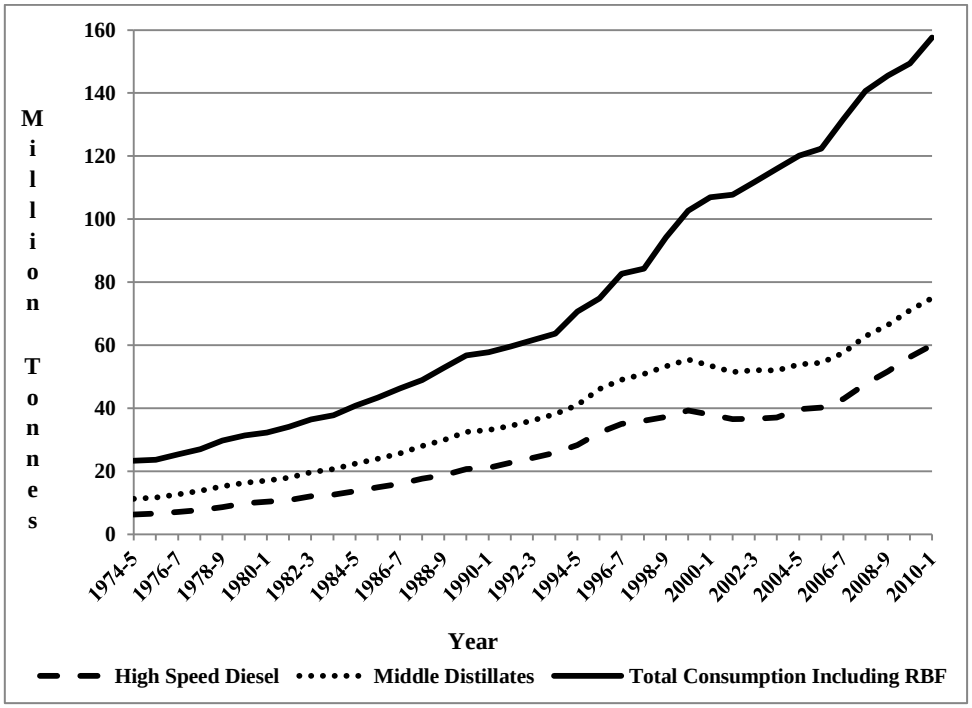
Full Report

1 Introduction

Fossil fuels, especially petroleum products, are currently the most widely used source of energy worldwide. But, these also constitute non-renewable sources of energy. Despite growing interest and technological capability to harness energy from renewable sources, their current adaptability to cater to varied human needs is relatively less evolved than fossil fuels.[2]

Figure 1: Consumption of Diesel and Petroleum Products in India, 1974-5 to 2010-1



Source: Centre for Monitoring Indian Economy, Energy, 2011. Indian Petroleum and Natural Gas Statistics, 2010-1.

Notes: RBF: Refinery Boiler Fuel

Figure 1 shows that consumption of diesel has gradually risen from six million tonnes to about 60 million tonnes between 1974-5 and 2010-1. During that period, the share of diesel in total consumption of petroleum products has varied from a low 27 per cent in 1974-5 to a high 43 per cent in 1995-6 and 1997-8.

[2] Non-renewability arises because rate of depletion (exploitation) far exceeds rate of (re)generation. Fossil fuels contain high percentages of carbon and include coal, petroleum, and natural gas. Petroleum occurs naturally in liquid form, imparting it with the highest degree of adaptability amongst fossil fuels. Perhaps one of the defining attributes is the ability / ease to set fossil fuels afire and redirect resultant heat energy for transformation into more useful forms. Renewable energy sources consist of sun, wind, tidal waves, etc.

In 2008-9 production of diesel constituted almost 78 out of 190 million tonnes of petroleum products (GoI, 2012).[3] Its contribution in terms of total energy consumed may, perhaps, be more significant. From 1974-5, there was a rise in the proportion of diesel, in total petroleum products consumption, until 1993-4 (41 per cent). This was followed by a short five-year interval with mild fluctuations until 1997-8 and then a period of decline until 2003-4 (32 per cent). However, in the last few years, diesel appears to be rapidly consolidating its pre-eminent position constituting 38 per cent of petroleum-products consumption in 2010-1.

Diesel is consumed for a variety of purposes and India relies heavily (around 80 per cent) on imported crude oil (the principle raw material) for its production. This in turn gives rise to a host of concerns including, on pricing mechanism that on one hand influences technology adoption and resource allocation, while on the other hand impacts current account and fiscal balance. As a consequence, price of diesel and efforts to maintain its uninterrupted availability has engaged the attention of policy and decision makers.

The next section in this report identifies the important economic activities that use diesel and discusses the contribution of those sectors to GDP. Other important petroleum products and, their limited substitution possibility in the extant technological setting are highlighted. The modal-mix for transportation in India is also discussed. *Section 3* enunciates the declared policy agenda for the hydrocarbon sector and summarises the evolution of pricing regimes. The importance of petroleum taxes for public finance at the federal and provincial levels is discussed in *section 4*. Some principal concerns in exercising a strategy for reforms are enumerated in section 5. The impact of changes in diesel and / or petroleum prices, including taxes and subsidies, is explored along a few dimensions in *section 6*. Analysis of certain sectors, highlighting the cost of diesel (and / or petroleum products) as a proportion of total cost of production, is presented in *section 7*. The report is summarised in *section 8* with some suggestions on reform imperatives.

[3] A table to convert mass into volume is in *Appendix A*. Diesel is a *middle-distillate* in fractional distillation of crude petroleum (*via* thermal / fluid-catalytic cracking processes). Petroleum-derived diesel is composed of about 75 per cent saturated hydrocarbons (primarily paraffins including *n*, *iso*, and *cyclo*-paraffins), and 25 per cent aromatic hydrocarbons (including naphthalenes and alkylbenzenes) The average chemical formula for common diesel fuel is $C_{12}H_{23}$, ranging approximately from $C_{10}H_{20}$ to $C_{15}H_{28}$. In the year 2009, consumption of petroleum products in the world across *light distillates : middle distillates : fuel oil : others* was in the ratio 32.3 : 35.9 : 10.3 : 21.4. In that year 84077 thousand barrels were consumed daily (with *light distillates : middle distillates : fuel oil : others* : : 27173 : 30146 : 8797 : 17961, see Table XI.10, GoI (2011), Page 140). United States of America (49.3 : 28.3 : 2.8 : 19.6) and Japan (38.1 : 31.4 : 10.3 : 20.2) appear to be the only countries in the world with higher proportion for Light Distillates.

2 Uses of Diesel in India

Among the existing fuels, diesel presents applications across a wide (if not widest) variety of uses in India. Energy obtained from burning of diesel is primarily utilised for:

- Transportation: Goods – railways (freight), maritime (carriers, liners), military vehicles, heavy and light commercial vehicles; Passenger – railways, roadways [buses, personal vehicles (cars, utility vehicles)], waterways [motor-boats, steamers, ferries, catamarans, yachts, cruise ships];
- Power generation: power plants, industrial captive power, back-up generators (large commercial, residential units);[4]
- Industry;
- Farm equipment; and
- Military equipment.

Farm and military equipment include some activities that may be classified as transportation.[5] *Table 1* shows the share of diesel consumed by broad areas of economic activity, in India. The contribution of respective activities to GDP is also presented. It is observed that diesel is used as input in activities that together account for about two-fifths of GDP in India during 2008-9 and 2009-10.

Table 1: Sector-Wise Share of GDP and Total Diesel Consumed (per cent)

Sector	Mode	Diesel Consumed			GDP	
		2008-9	2009-10	2010-1	2008-9	2009-10
Transportation	Railways	4.2	4.0	4.0	1.0	1.0
	Water	1.4	1.2	0.9	5.6	5.5
	Aviation	negligible				
	Road	59.6	60.0	60.4		
Industry		10.2	10.7	10.5	15.8 (10.6)	15.9 (10.7)
Power Generation		8.3	8.3	8.2	2.0	2.0
Agriculture		11.9	12.1	12.2	15.7 (13.3)	14.6 (12.3)
Miscellaneous		4.2	3.5	3.6		

Source: GDP data from http://mospi.nic.in/Mospi_New/upload/NAS_web_2011_excel_29aug11.htm accessed on February 29, 2012.

Notes: GDP data in transportation services is available for 'railways' and 'other transport services' the latter includes air and water transport; Share of Industry in GDP pertains to 'manufacturing' (registered (in parenthesis) plus unregistered); Share of Power in GDP relates to 'electricity, gas

[4] Diesel used in running water-pumps for irrigation is likely accounted under either 'power generation' or, more likely 'farm equipment' ('Agriculture' in table 1). Diesel used to power mobile telephone towers is likely accounted under 'power generation'. Some suggest that roughly one-third of diesel for power generation caters to the need of the telephone towers.

[5] For some uses, the users may be further categorised along differing dimensions (say, socio-economic, gender, and age profiles in passenger transport; type of industry in captive power generation; size-holding of agricultural land among farm equipment users). This report however, does not explore these dimensions.

and water supply'; Share of agriculture in GDP includes 'agriculture (in parenthesis), forestry and fishing'.

However, the bulk of diesel (around 65 per cent) is utilised in the transportation sector, which accounts for about 6.6 per cent of GDP. *Table 2* presents a more disaggregated picture of GDP in the Indian transportation sector. Road-transportation, contributing 4.8 per cent of GDP in 2008-9, predominates with a share of 70 per cent of total transportation sector GDP. The significance of any change in diesel prices, on transportation sector, cannot thus be over-emphasised.

Table 2: Share of Different Modes of Transport in GDP (Factor Cost at Constant Prices, Per cent)

Year	Railways	Road Transport	Water Transport	Air Transport	Services*	Total
1999-2000	1.3	3.8	0.2	0.2	0.5	6.0
2003-4	1.2	4.3	0.2	0.2	0.5	6.3
2008-9	1.0	4.8	0.2	0.2	0.4	6.6

Source: GoI (2011a), Road Transport Yearbook (2007-09), Volume I.

Notes: Data for 1999-2000 and 2003-4 are at constant 1999-2000 prices and for 2008-9 at constant 2004-5 prices. * Alludes to services incidental to transportation.

As per Chaturvedi Committee report (2008), in the year 2006-7 (direct) *bulk* sale of diesel constituted 22.3 per cent of total sales, with the remaining 77.7 per cent termed as *retail* sales. Bulk purchases by railways and road transport corporations accounted for 53 per cent of such purchase (that is 11.8 per cent of total sales). The remaining 47 per cent of bulk purchase (that is 10.5 per cent of total sales) was for industrial (captive power) use / power generation.

More than three-fifths (61.9 per cent) of retail diesel sales (that is 48.1 out of 77.7) of the oil marketing companies (OMCs) is executed at outlets located along (national and state) highways. *Table 3* gives the distribution of the remainder 38.1 per cent of retail diesel sales across population habitats.

Table 3: Retail Sales of Diesel (Per cent of Total Sales)

Type of Habitat	Population (in million)	%
Large Cities and Metros	above 1	9.8
Mid-Size Towns	0.2 – 1	8.0
Small Towns	< 0.2	13.7
Rural and Remote Regions		6.7

Source: Chaturvedi, 2008.

Notes: 1 million equals 10 lakhs. Excludes sales from retail outlets located along national and state highways.

It is likely that a significant fraction of diesel purchased from retail outlets in mid-size and small towns, as also in rural and remote regions, may be used by small industries and agriculturalists for non-transportation uses (*cf*. Table 1).[6]

2.1 Relative Importance of Different Petroleum Products in the Indian Economy

In the last few years, Indian economy has emerged as one of the fastest growing in the world. Growth in economic activity largely determines increase in energy use and by corollary, consumption of petroleum products. But, consumption of different fuels grows at differing rates and, their share in total may change.

Table 4 shows the share in consumption of differing petroleum products. Consumption of all fuels has risen, but the share of superior kerosene oil (SKO) has declined, despite being a highly subsidised commodity. Used for lighting in rural areas, SKO is sold primarily through public distribution system (PDS) outlets. Some allege that uptake of PDS kerosene has registered a decline, primarily on account of constrained supply. This is difficult to ascertain, but there apparently is no newspaper report, in recent years, highlighting any incidence of scarcity (usually depicted in long queues of hapless consumers).

Table 4: Share in Consumption of Petroleum Products (Per Cent)

Fuel	2000-1	2010-1
LPG	7	9
Motor Spirit (MS) / Petrol	6	9
High Speed Diesel (HSD) / Gasoil	37	38
SKO / Aviation Turbine Fuel (ATF)	13	9
Other Products	36	35

Source: Government of India (2012), Indian Petroleum & Natural Gas Statistics 2010-11, Economic Division, Ministry of Petroleum and Natural Gas, March 2012.

Notes: LPG includes both domestic (subsidised) and commercial (unsubsidised) supplies.

It is, therefore, likely that with increased electrification in rural areas, use of incandescent (filament or fluorescent) lamps is firmly displacing kerosene lamps that provide poor illumination. Use of SKO as cooking fuel hardly gained acceptance in rural areas, and in urban areas it is used only as stop-gap between liquefied petroleum gas (LPG) refills. However, there is reason to believe that large quantities of SKO are used to adulterate diesel (and diverted from its intended use). Shenoy (2010) refers to NCAER (2005) which estimated that around 38 per cent of PDS kerosene was diverted to the black market and did not reach the intended recipients. Again, with improvement in supply-tracking mechanism, it is likely that in recent years such diversion has also been brought under some check.

[6] Some, rather most of, diesel consumed by industry is for captive power generation. Less than one per cent of all electrical power generated in India uses diesel as fuel. Diesel in agriculture is used to run tractors, thrashers, tillers, harvesters, water-pumps, and even small generator sets.

In contrast, shares of LPG, petrol, and diesel have grown. Economic growth and rise in incomes has raised the demand for transportation, both freight and human (and in latter, both business and personal). It has also fostered individual aspiration to own private vehicles. As a consequence, both petrol and diesel consumption have risen and likely to grow further. It is likely that, if diversion of SKO (in diesel adulteration) were curtailed, then not only would its share decline further but also the consumption of diesel may show higher acceleration. Domestic LPG, also a subsidised fuel, gained further acceptance as clean cooking fuel. Reportedly, there is some diversion for its use in transportation in urban areas, as also into commercial activities.

A motivation, to develop and use viable substitutes for diesel,[7] arose from a rapid decline in ambient air quality, especially in large urban agglomerations. A major reason for this decline in air quality was attributable to the emissions / residues from use of diesel as fuel in engines (as also its adulteration with the highly subsidised SKO). This, perhaps, resulted in significant rise in public-health costs from elevated incidence of pulmonary and respiratory tract diseases. To ameliorate this situation in Delhi, compressed natural gas (CNG) was mandated as substitute for diesel, in all public transport vehicles. This has often been showcased as a successful policy intervention and similar initiatives are also underway in other urban agglomerations.[8]

2.2 Restructuring the Modal-mix in Transportation and Options to Moderate Growth in Diesel Consumption

Table 1 showed that, 65 per cent of diesel consumed goes towards fulfilling the need for transportation. More than one half of this is taken up by trucks that are known to be less efficient (on per net tonne-kilometer basis) than railways. It is a common refrain that railways are losing traffic (both freight and passenger) to road transport. In case of passenger traffic the share of rail to road stood at 15:85, and for freight traffic the corresponding shares stood at 30:70. However, railways consume around one-fourth as much diesel per net tonne-kilometer as trucks (GoI, 2010a). Despite higher efficiency in fuel use for railways, Sriraman, Anand, and Karne (2006) have projected that the share of road transport in freight is likely to grow and stabilise at about 85 per cent.

There is some evidence that average speed in road transportation is very low (GoI, 2008)[9] and likely to worsen. This is due to not only poor quality of roads, but also rapidly rising traffic

[7] Recent release of the World Health Organisation (WHO) has placed diesel in the list of 'known carcinogens'.

[8] While not known with certainty, single fuel based public transportation policy carries at least three latent risks. *First*, motivation to adopt a new fuel (say, CNG in Delhi for stage carriages, auto-rickshaws (TSRs), and taxis) is incentivised. Relatively speaking, then there is greater subsidisation of the new fuel. Unless closely co-ordinated, a wide price wedge between the substituting (CNG) and substituted (diesel) fuel, may motivate others (private cars) to also use the subsidised fuel. *Second*, unless complemented with command and control practices, this could transform the extant tendency towards dieselisation, into a drift towards CNGification, and perpetuate fuel subsidies. *Third*, and more importantly, some researchers have cautioned on the likelihood of rising concentration of finer particulate matter (PM < 10 microns) in the ambient atmosphere, from increased use of gaseous fuels that may aggravate attendant (pulmonary and respiratory tract diseases) public-health costs.

[9] This report prepared by Wilbur Smith and Associates notes that the average speed of transit (along major corridors) in larger-sized cities is significantly lower than the average speed of transit in smaller-sized cities. For Delhi, in the year 2007 this was estimated at 17 kmph.

density (number of vehicles per kilometre of road length) that has far outstripped increase in road density (kilometre of roads per square kilometre area). Provincial institutions for revenue collection on freight,[10] and check posts place stoppages on traffic movement. This results in reduction in fuel-use efficiency. On a kilometres-per-litre basis, this is estimated to be of the order of 25 per cent or more (Sriraman, Anand, and Karne, 2006, Deloitte, 2003). Improvement in road infrastructure would help reduce the turnaround time for vehicles. This can benefit operators in more than one way – (a) improve fuel-efficiency (b) reduce associated man-days per trip, (c) save on repair and maintenance, thus reducing variable costs. Further, the transport operator may (d) plan higher number of trips in a given period, (e) increase vehicle utilisation, and consequently reduce per trip allocation of capital cost.

In order to improve the efficiency of diesel use in transportation at a macro-aggregate level, it is imperative that (a) road infrastructure is improved significantly, and (b) efforts should be redoubled to pull traffic in favour of railways. There are complementary or supplemental inputs / linkages, including institutional mechanisms that may need to be strengthened. Especially, institutional mechanisms for subsidising, taxing, and pricing of fuels need to evolve around an integrated energy policy. For example, GoI, 2010a recommends that aligning diesel prices with international prices may (a) arrest the drift of private car owners towards diesel driven vehicles, (b) motivate truck operators to pay more attention to diesel efficiency of their vehicles, and (c) enhance the viability of freight transportation by railways.

Given the profile of uses and users of diesel, its substitution possibilities often appear to be severely circumscribed. Until recently, fuel used (in road-transportation vehicles) was mostly determined by engine-power (capacity). Most (relatively speaking) high-powered engines use diesel for fuel (except in case of specialised uses). But, as the experiment with CNG in Delhi shows, implementing a policy drawn-out in phases, over a reasonable period, may yield significant dividends. It is likely that, in the medium term, use of diesel for (captive or stand-by) power generation, and to run water-pumps for irrigation in agriculture, may be significantly curtailed by ensuring regular and stable supply of electric power from the grid.[11]

3 Policy on Petroleum Products

Fossil fuels, especially petroleum products, occupy a pre-eminent position in all economies of the world. As an essential input for economic activity, they also necessitate continued involvement of the government. The *India: Hydrocarbon Vision-2025* (see www.petroleum.nic.in/vision.doc) intends to:

- Assure *energy security* by achieving self-reliance through increased indigenous production and investment in equity oil abroad.

[10] Octroi, levied on goods entering a municipal area, is a significant source of revenue in Maharashtra and some other provinces.

[11] Tariff rationalisation and improvement in quality of power supplied to agriculturists may motivate farmers to use more efficient pump-sets. Indeed regular and stable power would directly reduce use of diesel to run pump-sets and indirectly benefit agricultural sector by reducing misuse or overuse of ground-water. It is reported that in several regions there is increased incidence of excess withdrawal of water, flooding of fields, and consequent loss in soil quality. Metering and monitoring could bring significant improvement.

- Enhance *quality of life* by progressively improving product standards to ensure a cleaner and greener India.
- Develop a globally *competitive industry* in hydrocarbon sector, that could be benchmarked against the best in the world through technology upgradation and capacity building in all facets of the industry.
- Have a free market and promote healthy competition among players and improve customer service.
- Ensure oil security for the country keeping in view strategic and defence considerations.

While, the above constitute the desired outcomes or end objectives, the vision also identifies the essential *policy ingredients* that affect these objectives. These are enumerated as (i) exploration and production, (ii) external policy and oil security, (iii) natural gas, (iv) refining and marketing, (v) tariff and pricing, and (vi) restructuring and disinvestment.

The fifth policy ingredient – tariff and pricing policy – determines the scope of this report. A rational tariff and pricing policy is vital to ensure healthy growth of the hydrocarbon sector and to protect consumer interests. The vision statement enunciates the following objectives under this policy. These are to,

- provide incentives for cleaner, greener, and quality fuels to promote environment friendly hydrocarbon sector.
- balance the need to boost government revenue with the need to align duties with Asia-Pacific countries and moving the prices to international levels.
- promote new investments by ensuring adequate protection to domestic producers.
- remove subsidies and cross-subsidies to promote efficient and optimal utilisation of scarce resources and also to eliminate adulteration.

To achieve these objectives, the specific actions for execution include, (i) phasing out existing subsidies as early as possible, (ii) setting-up a group of experts to determine appropriate levels of tariffs and duties for introduction in a phased manner as early as possible, (iii) transferring subsidies (both (a) freight subsidy on supplies to far-flung areas and (b) subsidies on products) to the fiscal budget,[12] and (iv) increase linkage of consumer price of natural gas from current level of 75 per cent fuel oil (FO) import parity to near 100 per cent.

While, the description of objectives and the commensurate administrative measures they entail appear to be incontrovertible, the precise actions at the grass-roots level have often remained mired by controversy.

[12] It is deemed necessary to continue with some concession to maintain the supply-line in hilly and remote areas, even after decontrol of marketing.

3.1 Pricing of Petroleum Products

Efficient pricing and, by corollary, taxation / subsidisation, of goods in general, and petroleum products in particular, is generally analysed in relation to the prevalent international prices. International prices are axiomatically assumed to be competitively determined and therefore, efficient. The exchange rate of domestic currency thus influences the efficient pricing of goods in the domestic economy.

The pre-independence policy of import parity pricing (IPP), for petroleum products, continued in vogue for more than quarter of a century after independence. However, with the first major oil-shock in the post-independence period, a cost-plus basis of pricing was evolved. This was popularly referred as administered price mechanism (APM). Later, it was decided to deregulate all petroleum products except LPG and SKO. But, the principal transportation fuels (namely, MS and HSD) were soon brought under close watch. *Box 1* presents the evolution of petroleum product pricing in India.

Box 1: Chronology of Petroleum Products Pricing Policy in India

- Import Parity Pricing (IPP) in pre-1975 era (Damle; Talukdar; and Shantilal Committees)
- Oil Prices Committee (OPC, Krishnaswamy, 1974) – cost plus basis (also called administered price mechanism or APM): crude oil cost + refining cost + 15 % return on capital employed (RoCE)
- Oil Cost Review Committee (OCRC, Iyer, 1984) – revised the RoCE element to weighted average of (a) cost of borrowing and (b) 12 % post-tax return on net worth
- Oil Pool Accounts maintained by Oil Co-ordination Committee (OCC): Crude Oil Price Equalisation (COPE) Account, Cost and Freight (C&F) Account, Product Price Adjustment (PPA) Account
- Dismantling of APM, closure of oil pool accounts – issue of special bonds to oil companies (recommended by Strategic R-Group)
- Market Determined Pricing Mechanism (MDPM) – From April 1, 1998, moved to adjusted import parity pricing for controlled (MS, HSD, SKO, ATF, LPG) products. Prices / markets decontrolled for industrial products (Naphtha, FO, LSHS, Bitumen, Paraffin)
- MS and HSD deregulated in 2002
- Trade Parity Pricing (TPP, Rangarajan, 2006) for MS and HSD (with weight of 80 % IPP and 20 % Export Parity Price (EPP))
- Continue with TPP (Parikh Committee, 2010) for HSD, market determined pricing for MS – Government takes an in-principle decision to move to market determined pricing both at refinery gate and retail level for HSD at an appropriate time

Source: GoI, 2006; GoI, 2010a.

The current refrain is that while pricing of HSD has been deregulated, it is not decontrolled. In particular, (see *table 5*), the price faced by OMC (that is, refinery

transfer price (RTP), item 9) appears to be *deregulated* and linked to the international prices. But, the retail selling price (RSP) and its build-up is completely policy determined and therefore, *controlled*. Note however, that there is no explicit policy to subsidise HSD.

The price build-up of diesel in Delhi under the current regime, for example, is presented in *table 5* below.

Table 5: Price Build-up of Diesel in Delhi (Effective 16th Nov, 2011)[13]

Sl. No	Elements	Unit	Value
1	FOB Price at Arab Gulf of Gasoil (Diesel) BS III equivalent	$/bbl	130.22
2	Add: Ocean Freight from AG to Indian Ports	$/bbl	1.55
3	C&F (Cost and Freight) Price	$/bbl INR/ltr	131.77 40.39
4	Import Charges (Insurance/Ocean Loss/LC Charge/Port Dues)	INR/ltr	0.38
5	Customs Duty @ 2.58% (2.5% + 3% Education Cess)	INR/ltr	1.05
6	Import Parity Price (IPP, at 29.5^0 C) (Sum of 3 to 5)	INR/ltr	41.82
7	Export Parity Price (EPP, at 29.5^0 C)	INR/ltr	39.91
8	Trade Parity Price (TPP, 80% of 6 + 20% of 7)	INR/ltr	41.44
9	Refinery Transfer Price (RTP) for BS-III Diesel (Price Paid by Oil Marketing Companies to Refineries)	INR/ltr	41.44
10	Add: Premium recovered for BS-IV Grade over BS-III	INR/ltr	0.04
11	Add: Inland Freight and Delivery Charges	INR/ltr	0.73
12	Add: Marketing Cost of OMCs	INR/ltr	0.65
13	Add: Marketing Margin of OMCs	INR/ltr	0.79

[13] This table is illustrative only. Two versions effective May 16 and July 1, 2012 are in *Appendix C* and *Appendix D* respectively.

Sl. No	Elements	Unit	Value
14	Total Desired Price – Before Excise Duty, VAT and Dealer Commission (Sum of 9 to 13)	INR/ltr	43.65
15	Less: Under-recovery to Oil Marketing Companies	INR/ltr	10.17
16	Price Charged to Dealers (Depot Price) – Excluding Excise Duty and VAT (14 – 15)	INR/ltr	33.47
17	Add: Specific Excise Duty @ INR 2.06 /ltr (INR 2.00/ltr + 3% Education Cess)	INR/ltr	2.06
18	Add: Dealer Commission (DC)	INR/ltr	0.91
19	Add: VAT (incl. VAT on DC) for Delhi @ 12.50% + Air Ambience Charges @ INR250/kl - rebate @ 375/kl	INR/ltr	4.46
20	Retail Selling Price at Delhi	INR/ltr	40.91

Source: http://ppac.org.in/writereaddata/Price%20Build%20up%20Sensitive%20Products.pdf update of November 16, 2011.

Upon comparison with similar tables at differing time-points,[14] certain patterns may be deciphered (see also *table 6* later). Both IPP and EPP (items 6 and 7) are determined from the FOB price (at Arab Gulf, in USD per barrel, item 1). EPP is the price in USD/bbl converted into INR/litre. IPP includes three more elements namely, (ocean) freight, insurance, and customs duty (a barrel contains approximately 159 litres). However, both EPP and IPP may change due to variations in either the (USD-INR) exchange rate or change in FOB price (USD/bbl) or, both. Note that TPP (item 8) is also the RTP (item 9).

Between item numbers 1 and 15 in *table 5*, most elements of cost depict some variation with the FOB price, except items 10, 11, and 12 that appear to be estimated differently. Further, item numbers 16 to 20 do not bear any relation to the FOB price or the exchange rate and are indeed determined by domestic policy.

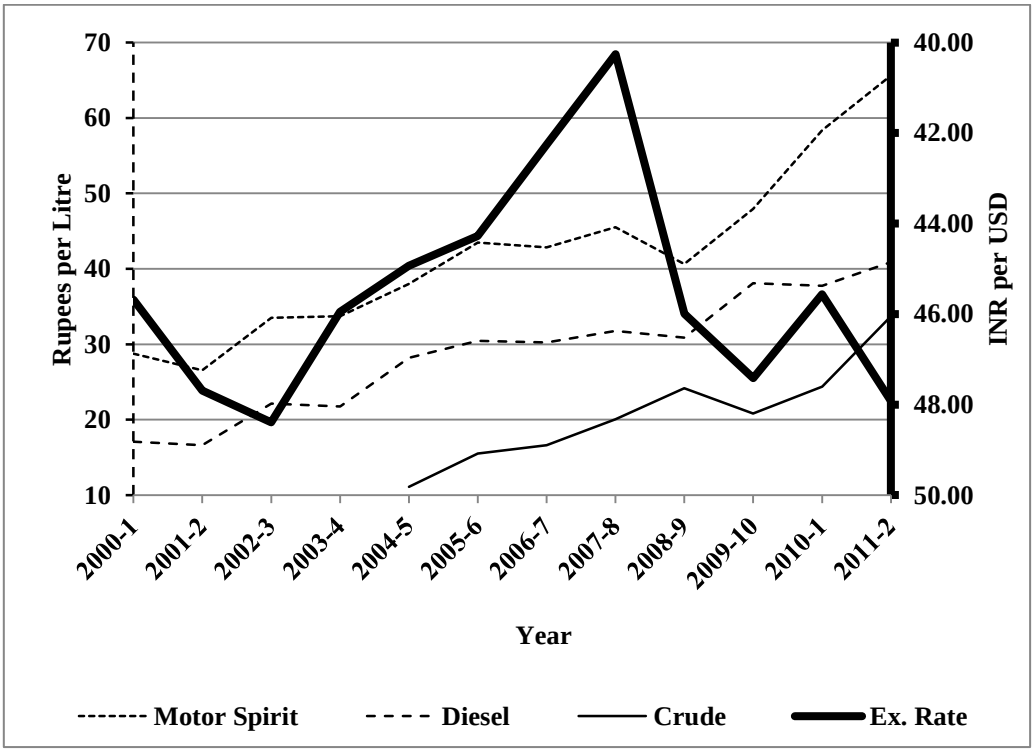
The extant policy of TPP, with weighting of 80 and 20 per cent respectively for IPP and EPP, has weak theoretical grounding. A higher weight on IPP is particularly inadmissible for *refined* products when India has emerged as a competitive exporter. Further, inclusion of customs duty, while offering unwarranted protection appears inconsistent to determine IPP. Theoretical guidance favours benchmarking of domestic prices of an exportable (HSD) to its

[14] For the four sensitive / controlled / regulated petroleum products, price build-up tables are updated, fortnightly for MS and HSD and, monthly for LPG and SKO.

FOB price. However, a similar suggestion in Chaturvedi (2008) committee report, to use EPP to benchmark domestic prices, did not find favour with the then government.[15]

Trend in retail prices of MS (petrol / gasoline) and HSD (gas oil) are depicted in *figure 2*. The exchange rate movement and prices for the Indian basket of crude are also depicted. It is observed that, in the period beginning 2000-1, the Indian rupee depreciated for a couple of years and breached 48 INR per USD in the year 2002-3. It then appreciated continually to reach almost 40 INR per USD in 2007-8. Thereafter the rupee depreciated sharply and reached close to its 2002-3 levels in 2009-10. The rupee appreciated against USD in 2010-1, but took a steeper fall again in 2011-2. Further, during the entire period, diesel prices have slowly ratcheted-up. However, price of petrol was lower in 2008-9 than in 2007-8, while that of crude declined in 2009-10.

Figure 2: Trend in Price of Crude (Indian Basket) and Retail Selling Price of Motor Spirit, Diesel (Delhi)



Source: Indian Petroleum and Natural Gas Statistics (various issues), MoP&NG, GoI; http://ppac.org.in; 2011-2 exchange rate from http://www.x-rates.com/d/INR/USD/hist2012.html

Notes: Exchange rate on the Right vertical axis (bold line in reverse order); Prices are plotted on the Left vertical axis. Crude prices are USD rates per barrel multiplied by period

[15] We are therefore faced with a situation where domestic consumers are served only by the public sector OMCs. Private sector refiners are not only exporting but also supplying HSD to the public sector OMCs. Given the current practice of complete insulation of domestic RSP of HSD, the choice of EPP over TPP / IPP may cause only a minor adjustment in the estimate of under-recovery of OMCs. However, benchmarking RSP with EPP may be far-reaching to realign incentives between (a) public and private sector producers, and (b) producers and consumers.

average USD exchange rate and divided by 159 (approximate litres per barrel). End of period prices for motor spirit and diesel.

In free markets under competitive conditions, the main components for pricing of products and services consist of (a) cost of raw-materials consumed and (b) payments for factors (value added from use of capital, labour, assets, and organisation) of production. However, governments often affect prices through (c) taxes, and (d) subsidies. These have direct and indirect financial implications for (i) governments, (ii) petroleum sector companies, (iii) sectors using the output of petroleum sector companies as inputs in their own production processes, and (iv) private consumers.

Analysis of cost components *a* and *b*, necessarily entails a deeper investigation than what can be deciphered from *table 5*. In particular, this necessitates a detailed analysis of the accounts of disparate OMCs and subsequent consolidation of these accounts to derive sectoral insight. Though desirable, this is outside the scope of the current report. The following sections discuss only some aspects relating to components *c* and *d* in pricing of diesel.

4 Revenue from Taxation of Petroleum Products

As mentioned in *section 3.1*, the actual price of diesel facing retail purchasers is essentially policy determined.[16] There are two items of revenue for the federal government (a) *customs duty* and (b) *excise duty*. Customs duty is applied to imports on the CIF price at an *ad-valorem* rate of 2.5 per cent (with another 3 per cent education cess on customs duty). Thus on every litre of diesel imported, the federal government earns customs revenue of INR 1.05. Additionally, an excise duty is charged as a specific tax and yields INR 2.06 per litre (INR 2.00 plus 3 per cent education cess). The mechanism of implementing excise duty, not only impinges on domestically refined produce, but also acts as a countervailing duty.

The state or provincial governments collect *sales tax* (extant rate in Delhi is 12.5 per cent) on the sum of (a) depot price (or price charged to dealers), (b) excise duty, and (c) dealer commission. In addition, some provinces impose an *air ambience charge* (in Delhi this is INR 250 per kl) and also may offer a rebate on it (again in Delhi this is INR 375 per kl).[17] It is seen that, although sales tax is termed as value added tax (VAT), in practice it is not so. As per an agreement between the federal government and the collective of provincial governments, four 'sensitive' petroleum products, namely diesel, motor spirit, kerosene, and domestic LPG, are kept outside the VAT framework. Thus input-tax-credit is dis-allowed on diesel used as intermediate input in goods and services. Taxes imposed on these 'sensitive' goods may therefore trigger an element of cascading (tax on tax) in the system (see *section 4.2*).

[16] The price faced by bulk-purchasers (industry / railways / road-transport corporations) is perhaps lower by the value of dealers' commission (item 18) and a small element of excise and sales tax on it (out of item 19). Further, in Rajasthan for example, the State Road Transport Corporation enjoys a reduced rate of sales tax on diesel (13 as compared to 20 per cent for other consumers). Thus, the difference in price of diesel faced by different consumers is on account of tax-differential, that is a prerogative of government. But, in economic effect, it mimics price differentiation by a discriminating monopolist.

[17] The net result is an air-ambience *subsidy* instead of an air-ambience *charge*.

From *table 5* one finds that every litre of imported diesel with cost, insurance, and freight price of INR 40.77 yields INR 3.11 (INR 1.05 customs duty plus INR 2.06 specific excises, both inclusive of 3 per cent education cess) for the federal government. The yield for provincial governments is significantly higher at INR 4.46 for diesel sold from retail outlets in Delhi at INR 40.91 per litre. Thus more than 18 per cent of the retail sale price of diesel in Delhi accrues to the governments (federal and provincial) as tax revenue. We note here that the sales tax rate on diesel varies significantly across Indian provinces (from 7.5 per cent in Sikkim to 26 per cent in Maharashtra (within municipal limits, GoI 2010b, pp 32).[18] *Table 6* presents the elements of taxes on four 'sensitive' petroleum products.

Table 6: Federal and Provincial Taxes in Retail Sale Price of Important Petroleum Products (INR) at Delhi

Description	Diesel	Motor Spirit	Kerosene	Dom. LPG
Units	Per litre	Per litre	Per litre	Per cylinder
Retail Selling Price (RSP)	40.91	71.16	14.83	399
Federal Tax				
(i) Customs Duty	1.14	0	0	0
(ii) Specific Excise Duty	2.06	14.78	0	0
Provincial Tax				
VAT (Sales Tax)	4.46	11.86	0.71	0
Effective Date	May 16, 2012	June 3, 2012	May 1, 2012	May 1, 2012
Under-recovery by OMCs	13.64		31.48	480.31
Percentages				
Total Tax / RSP	19	37	5	0
Total Tax / (RSP – Total Tax)	23	60	5	0
Federal Tax / Total Tax	42	55	0	
Provincial Tax / Total Tax	58	45	100	

Source: PPAC. http://ppac.org.in/; http://iocl.com; http://www.hindustanpetroleum.com; http://www.bharatpetroleum.in;

Notes: Total Tax is sum of Customs Duty, Specific Excise Duty, and VAT. Specific Excise Duty is the sum of *Basic CENVAT Duty*, *Special Additional Excise Duty*, and *Special Additional Duty*). VAT is equivalent to Sales Tax. VAT (Sales Tax) here is the only Provincial Tax. Under-recovery for diesel is different from that in *table 5*. Note the differing effective dates for the different products.

Note the differing effective dates for diesel in the two tables (*5* and *6*). Note further, the FOB price at Arab Gulf (item 1) in *table 5* at 130.22 USD per barrel (effective November 16, 2011) is trifle higher than 130.12 USD per barrel in the corresponding table effective from a later date (see also the detailed price build-up tables effective May 16, and July 1, 2012 in *Appendix C and D*).

4.1 Cost Under-recovery in Diesel

From a simple reading of *table 5*, there does not appear to be any element of subsidy in sale of diesel. But, there is an element of under-recovery (item number 15) which is the difference

[18] Incidentally, the sales tax rate on HSD in Delhi is reported as 20 per cent in GoI 2010b, which is also the minimum rate agreed upon by the ECoSFM.

between the *desired* price and the depot price.[19] This corresponds to the difference between a target price and actual price that may be categorised as 'deficiency payment'. In this sense 'under-recovery' in diesel (and petroleum products, in general) could qualify under WTO ASCM (World Trade Organisation Agreement on Subsidies and Countervailing Measures) Article 1 definition of *subsidy* (as interpreted by Global Subsidies Initiative, 2010, pp 4).[20] And, therefore, a prospective candidate for reform.

As per the description in *table 6*, under-recovery on diesel is more than the tax (including both federal and provincial taxes). Note that per litre under-recovery on sale of diesel is 13.64 INR. This is almost a third higher than 10.17 INR (item 15) in *table 5*. The RSP however, is unchanged over the period. As described in *section 3.1*, such an increase in under-recovery is largely on account of depreciation in exchange rate between the two dates.[21]

In contrast, the sum total of taxes increased only marginally (around 1 per cent) from 7.57 INR (table 5) to 7.66 INR per litre of diesel. While, as per *table 5*, (federal and provincial) taxes measured 75 per cent of the estimated under-recovery, the corresponding figure as per *table 6* had dropped to 55 per cent.

Table 7 shows the under-recovery of OMCs in sale of sensitive (controlled or regulated) petroleum products and the fiscal subsidy (as per subsidy scheme 2002) on petroleum products in the federal government budget. Diesel appears to constitute the largest under-recovery in most years, and accounted for about 59 per cent of total under-recovery in 2011-2. There was some under-recovery even on petrol until 2010-1.

As described earlier, the estimate of under-recovery in diesel is largely affected from a combination of (a) USD-denominated Arab Gulf price, (b) the prevalent USD-INR exchange rate, and (c) policy on domestic dealers' (depot) price. Under-recovery impinges on the profit and loss accounts of OMCs. The under-recovery of the OMCs are sought to be mitigated by (a) transfer from the upstream E&P companies (that make windfall profits when international prices rise), (b) contribution from the federal budget, and (c) issue of oil bonds by the OMCs (see Chaturvedi, 2008, Table 3.1, pp 7).[22]

[19] *Table 5* shows the depot price as being derived residually after deducting the under-recovery of OMCs from the desired price. But, our understanding is that the depot price is determined by policy, and hence it is the under-recovery that is residually determined.

[20] It is however not clear how the target price / desired price may be ascertained or set. Should it be based on domestic costs, domestic opportunity cost, international / world price, competitive price, or some notion of fair and remunerative price? Should some elements of taxes be in-built into the desired price? But it can hardly be over-emphasised that the mechanism of determination of both target and actual price are critical in estimating subsidy, if any.

[21] Effective June 1, 2012, the FOB price at Arab Gulf had declined to 122.7 USD per barrel and under-recovery was reported at 12.53 INR per litre. It appears that several cost elements reported in the price build-up table are derived on a formula basis (in turn devised on the recommendations of some committee). Further, these formulaic expressions are scattered over various reports and documents that have not been compiled into a unified document and may not be easily available in the public domain.

[22] Oil-bonds have been discontinued after 2008-9. Although desirable, tracking the under-recovery mitigation measures by specific products (say, diesel) is beyond the scope of this report.

Table 7: Under-recovery of Oil Marketing Companies and Fiscal Subsidy on Sale of Sensitive Petroleum Products (billion INR)

Petroleum Products	2005-6	2006-7	2007-8	2008-9	2009-10	2010-1	2011-2
Under-recovery of Oil Marketing Companies							
Petrol	27.2	20.3	73.3	51.8	51.5	22.3	
Diesel	126.5	187.8	351.7	522.9	92.8	347.1	811.9
Domestic LPG	102.5	107.0	155.2	176.0	142.6	217.7	300.0
PDS Kerosene	143.8	178.8	191.0	282.3	173.6	194.8	273.5
Total	400.0	493.9	771.2	1032.9	460.5	781.9	1385.4
Fiscal Subsidy in Federal Government Budget							
Domestic LPG	16.1	15.5	16.6	17.1	18.1	19.7	21.4
PDS Kerosene	10.6	9.7	9.8	9.7	9.6	9.3	8.6
Freight Subsidy	0.2	0.3	0.3	0.2	0.2	0.2	0.2
Total	26.8	25.5	26.7	27.1	27.9	29.3	30.2

Source: Reproduced from PPAC. http://ppac.org.in/

Table 5 shows that under-recovery in diesel is to the extent of 10.17 INR per litre (Item number 15). If this under-recovery were to be eliminated without affecting the tax revenue (in turn, by adjusting the specific excise duty or the *ad-valorem* sales tax rate, or both) and the Dealer Commission, then the final retail price may rise by 25 per cent (to 51.08 INR per litre). But if under-recovery were to be eliminated by changing only the Dealer Price (and retaining both Specific Excise Duty and the *ad-valorem* sales tax rate), then the final retail price would rise by about 28 per cent (to 52.32 INR per litre). This additional three per cent increase in retail price is purely on account of *ad-valorem* rate of sales tax which translates into revenue gain for the provincial government.

The tax element in price, discussed above, constitutes only a part of government revenue attributable to diesel use (production and consumption). But, supplementing the estimate of under-recovery with elements of (indirect) taxes (as in *tables 5* and *6*) also does not give a complete picture. And, it gets muddled when one notes that there are components of revenue from royalty on crude, corporation taxes, and dividend payments of exploration and production (E&P) companies as well as OMCs that are also derived due to final demand for petroleum products, including diesel. A component of fee for checking / testing car vehicle emission also accrues as revenue at the local government level. Is it appropriate then, to portray the estimate of under-recovery (as shown in *table 5*) as a fair approximation of subsidy on consumption of diesel or as losses of OMCs?

The important revenue streams into the federal and provincial exchequers are detailed in *table 8, section 4.2*. Chaturvedi (2008, *table* 2.5, pp 6) committee report shows that, as compared to India in most OECD countries (except in USA), the tax element constitutes a significantly higher fraction in retail price of diesel. Further, retail price of diesel, per litre in

equivalent INR, in those OECD countries (including USA) is higher than in India (see also *Appendix B*). But, governments in India, both at the federal and provincial levels, rely heavily on petroleum sector taxes for their revenues. The following sub-section discusses this aspect in greater details.

4.2 Revenue Handles in India: Federal-Provincial Contention

GoI (2006) reports that customs and excise levies on petroleum products contribute about 40 percent of total customs and excise collection of the federal government, while sales taxes on petroleum products constitute a third or more of total sales tax collection of provinces.

Put differently, excise duty on petroleum products contributes about half of total revenue from such duties for the federal government. While, CENVAT on industrial fuels is eligible for input tax credit,[23] duty on majority of products namely, MS, HSD, bitumen, ATF, SKO, domestic LPG, and fuels supplied to power consumers are not eligible for input tax credit under CENVAT rules. Revenue from petroleum products for federal and provincial governments (*Table 8*) increased from INR 1572.2 billion to INR 2327.7 billion between 2006-7 and 2011-2. [24]

Table 8: Federal and Provincial Revenue from Taxation and Quasi-Taxation of Petroleum Products (billion INR)

Particulars	2006-7	2007-8	2008-9	2009-10	2010-1	2011-2
Customs Duty	100.4	126.3	63.0	45.6	241.4	100.1
Cess On Crude Oil	69.0	69.2	67.6	65.6	68.1	71.1
Excise Duty	519.2	547.6	541.2	624.8	680.4	619.5
Royalty on Crude Oil and Natural Gas	27.9	30.6	31.5	38.6	36.5	36.1
Corporate Tax (Income/Fringe Benefit/Wealth Tax)	121.5	163.2	120.3	179.4	171.5	163.8
Dividend to Central Govt.	79.6	76.5	45.0	80.7	98.1	100.6
Tax On Dividend	13.6	18.5	10.8	18.6	23.5	23.1
Profit Petroleum	34.6	41.5	47.1	54.7	36.1	73.8
Others (Includes Service Tax)	6.7	9.4	8.7	9.8	9.4	10.3
Contribution To Central Exchequer	**972.6**	**1082.9**	**935.1**	**1117.8**	**1365.0**	**1198.5**
Sales Tax/VAT	539.5	564.5	633.5	650.0	786.9	969.5
Royalty on Crude Oil and Natural Gas	35.7	41.8	24.5	33.5	46.4	75.1
Dividend To Provincial Govt.	0.2	0.3	0.2	0.2	0.2	0.2
Octroi, Duties (Incl. Electricity Duty)	18.9	16.8	19.4	18.9	21.6	29.9
Entry Tax / Others	5.3	11.1	5.3	18.3	34.9	54.5

[23] Input tax credit is a mechanism to eliminate cascading of taxes at various stages of value addition.

[24] It is relatively easier to tax public sector owned oil companies. Royalty and dividend payments are normally included under non-tax revenues, but may be indistinguishable from a tax in their economic impact. Excluding these non-tax revenues, the petroleum sector contributes (average for the period 2006-7 to 2010-1) more than 15 and 20 per cent respectively of gross central tax revenue and provincial tax revenues.

Particulars	2006-7	2007-8	2008-9	2009-10	2010-1	2011-2
Contribution To Provincial Exchequer	**599.6**	**634.5**	**682.9**	**720.8**	**890.0**	**1129.2**
Total Contribution To Exchequer	**1572.2**	**1717.3**	**1618.0**	**1838.6**	**2254.9**	**2327.7**

Source: Reproduced from PPAC. http://ppac.org.in/

The combination of specific duties and *ad-valorem* taxes on the petroleum sector, in recent years, ensured an increasing flow of revenue into government coffers, especially for the provincial governments (whose revenues are largely sourced from sales taxation of 'goods'). Prolonged pre-occupation with a narrow base of taxation, has however limited the capacity development of most provincial governments to handle newer bases. Efforts to widen tax-base to include various economic activities have often been stymied by the prevalent political-economy of the Indian federation.

The provinces on their part are hesitant to tax agriculture (whose size in GDP has been shrinking), while the federal government has been often perceived to wrest-away (pre-empt) the newer and expanding bases of taxation (namely, 'services') by using the constitutionally provided residual powers.[25] The pervasive apprehension of several provincial governments, in acceding to a full-fledged GST, arises from interplay of these perceptions that, on the one hand foment elements of suspicion in provincial governments against the intent of the federal government, and on the other expose the highly circumscribed capacity of provincial governments to experiment with handling new bases.

The Joint Working Group (JWG) set-up by the Empowered Committee of State Finance Ministers (ECoSFM) has recommended that a basket of petroleum products (see GoI, 2008) consisting of crude, MS, ATF and HSD should be kept outside the goods and services tax (GST). These excluded products (proposed by the JWG), contribute about 80 per cent of the total tax revenue from the petroleum sector. Exclusion at this scale is likely to defeat the logic of introducing GST, as these products impact on various stages in trade and industry.[26]

Of all petroleum products, MS and diesel together contribute 36 per cent central excise or about 10 per cent of total federal revenues. But, excise (specific) duty on (per litre) diesel is only about a third of that on MS (petrol). Given the prevailing structure of taxes, *table 6* shows that tax revenue from sale of one litre of diesel is less than 30 per cent of that from sale of a litre of MS (INR 7.66 from diesel against INR 26.64 from MS). In most OECD countries however, the trend is often towards greater parity in taxation of petroleum products. There is recognition of the rapid drift towards 'dieselisation' in government circles and GoI 2010a opines that, '…greater fuel efficiency of a diesel vehicle should not be penalised…' but '...a way needs to be found to collect the same level of tax that petrol car users pay from those

[25] Conversely, there is also a perception that the provinces have been gradually yielding bases or, that the federal government may be reluctant in sharing newer bases. After the 88th amendment, entry *92C* in the *Seventh Schedule of the Constitution* explicitly refers to "Taxes on services" under the *Union List*.

[26] This results in, what is termed as, cascading / multiplicative impact on tax revenues and retail prices due to non-implementation of input-tax-credit.

who use a diesel vehicle for passenger transport.' GoI 2010a therefore recommends a levy of an additional excise duty on diesel vehicles corresponding to the differential tax on petrol.[27]

5 Issues in Reform of Petroleum Product Prices and Taxes, Particularly Diesel

Reform in pricing (including taxes and subsidies) of goods and services, hitherto produced and provided by the state (public sector), is often (mistakenly) considered to be synonymous to 'deregulation' and a greater allowance for the interplay of 'market' forces. Existence of a public sector is often necessitated by an overwhelming perception of 'inadequacy' of markets. However, as economic societies develop the roles and domains of both markets and public sector may change and also interchange.

The Indian petroleum products sector predominantly lies in the 'public' domain and in its 'publicness' mainly with the federal government. Despite this, a veil of opacity appears to engulf the sector. It is now widely believed that such sequestering has inhibited sustainable development of the sector. The remainder of this section highlights some issues that have influenced or continue to dominate public discourse on petroleum products in general and diesel in particular.

Umbrella reforms or piece-meal sectoral changes

Section 4 highlights the extant *excessive reliance on petroleum taxes* both at the federal and provincial levels. This perhaps is an over-riding concern in effecting any wide-ranging reform (namely, GST) in administration of taxes. Unless the GST, when implemented, encompasses petroleum products, the cascading impact in present tax administration may remain unresolved.

Inward or outward orientation

Box 1 in *section 3.1* summarises the chronological evolution of petroleum products pricing, particularly diesel. In the aftermath of the oil crisis, inward looking policy in pricing of petroleum products gained strong constituency. But after a couple of decades, this influence had started to wane. Recent attempts at economic reforms in general and petroleum products pricing in particular, appear to bear a distinct influence of more open and outward orientated policy. The current policy of TPP however, has weak theoretical (or even practical) grounding. Especially as India has mustered huge refining capacity (far exceeding current domestic consumption), and appears to have established a distinct competitive advantage. Under the prevalent conditions, theory commends the use of EPP to benchmark domestic prices.

Frequent incremental steps or single-stage jump-start

Given the current technological environment, petroleum products sectors have strong forward linkages with other sectors of the Indian economy. Rudimentary estimates for the relative

[27] Additional Excise = (rate of excise on petrol – rate of excise on diesel) * (petrol consumption per year by an average petrol car user) * [{(1+ r)/r} * {1-(1/(1+r)^{10}}] where, r is discount rate and 10 years is the assumed lifetime.

strength of these linkages are derived using input – output production matrices and are discussed in the next section. But, it is to be appreciated that because of these linkages, any tax or price impulse in this sector (especially on diesel) is transmitted widely and rapidly. A strategy of *incremental reforms,* over a specified time horizon, may thus be preferred over a big-bang approach.[28] In particular, there is need to appreciate that *taxes and subsidies cannot be looked at in isolation, for any given good or fuel*. These must, necessarily, be studied in relation to competing and complementary technologies keeping the divergent uses and users at focal point.

Technology or subsidy targeting

It has been the experience that attempts to incentivise adoption of other fuels, has often morphed into subsidisation of *alternative fuels* (sometimes significantly below efficiency costs). As a result this approach creates a constituency to perpetuate the differential (from subsidisation), *creating new distortions*. It is desirable to cap aggregate subsidy and in order to promote equity analyse feasibility of alternatives like product differentiation, geographic segmentation, rationing, multi-part tariffs.

Promotion or discrimination

Next, a fine balance should be struck such that, *thermal efficiency of diesel (in comparison to lighter distillates) is not penalised*. Price divergence between MS and diesel has likely incentivised the use of diesel powered vehicles even in personal private transport. Technological advancement over the last few decades necessitates a reassessment of the emission / pollution dimension of individual fuels to rationalise tax-differentiation on such grounds.

Resource generation or allocation

The *choice to implement taxes as specific duties or ad-valorem rates* may have significantly differing impact when other input prices change. The design may indicate the importance that an administration places on protecting its revenues relative to its objective of stabilising prices.[29]

The list of issues that confront policy makers is perhaps longer and wider than those presented here. However, a reform strategy for pricing diesel may carefully evaluate the options to assess advantages and disadvantages in continuing with the current practice. In particular, policy guidance could include reference to the favoured options along with a clear justification.

[28] After dismantling of APM, the erstwhile National Democratic Alliance (NDA) regime implemented a creeping (or crawling) strategy of a series of small increases in RSP, albeit to varying degrees, for motor spirit, diesel, kerosene, and LPG.

[29] In practical mathematical modelling, most specific taxes are converted into their corresponding *ad-valorem* rates to facilitate relationship formulation.

6 Impact of Tax / Subsidy / Price Changes of Diesel on the Economy

In *sections 3, 4* and *5*, this report discusses some of the considerations in pricing of petroleum products. Some examples, of estimates for service / sector specific cost implications, from increase in diesel prices are considered in the following section. This section discusses some dimensions to assess the impact of petroleum product prices on economic behaviour and outcome at the aggregate level.

6.1 Inflation

Annual increase in international price of petroleum, by the end of March 2011, was about 37 per cent (see RBI, 2011, Table VI.2, pp 639). However, the domestic price (of oil), on average, grew by only 6.3 per cent. This reflects only a partial pass-through of international prices onto the domestic economy (and decreasing ratio of domestic to international fuel price, *cf*. scenarios described in Bhanumurthy *et al* (2012)). RBI (2011, pp 641) reports,

> *"Empirical estimates show that every 10 per cent increase in global crude prices, if fully passed-through to domestic prices, could have a direct impact of 1 percentage point increase in overall WPI inflation and the total impact could be about 2 percentage points over time as input cost increases translate to higher output prices across sectors."*

The weight of mineral oils (that is, diesel and all other petroleum products) in the extant WPI basket is close to 10 per cent (9.3644, see *Table 9*), which co-relates closely with the (estimated / expected) direct inflationary impact of oil-price change in the domestic economy. However, as the full impact of increase in international prices has been muted by administered price intervention, RBI warns that,

> *"Administered price interventions could keep inflation low in the near-term, but with significant risks to medium-term inflation through the impact on higher fiscal deficit apart from its impact on efficiency concerns. Even in the case of freely priced products, the pass-through remains incomplete. As against an increase of 42 per cent y-o-y in March 2011 in the Indian basket crude oil price, the domestic price of non-administered fuels increased by only 23 per cent. This indicates that prices could increase going forward as domestic inflation catch up with global trends. It is also important to make further progress in deregulation of fuel prices,* ***particularly diesel*** (emphasis added by the author). *This would enable demand to adjust appropriately to price signals, reduce fiscal deficit and make the inflation number more representative of underlying inflation conditions."*

Table 9: Weight in WPI of Major Groups (per cent)

Major Group / Commodities	1993-4	2004-5
Primary Articles	22.03	20.12
Fuel and Power, *of which*	14.23	14.91
Mineral Oils, *of which*	6.99	9.36

Major Group / Commodities	1993-4	2004-5
High Speed Diesel	2.02	4.67
Manufactured Products	63.75	64.97

Source: http://eaindustry.nic.in/WPI_Manual.pdf

The weight of Mineral Oils in wholesale price index (WPI) has been rising with each revision of the composition of the basket used for its estimation. In particular the weight of diesel in the basket has more than doubled. As a thumb-rule, given the weights as in Table 9 (and use of Laspeyre's Index in WPI)[30], a 10 per cent increase in diesel prices, with all other prices and demand for commodities remaining unchanged, would cause the general price level to rise by about 0.47 per cent. This may be construed as the direct or first round effect on prices. The total impact over medium-term may be significantly larger.

6.2 Elasticity of Demand

Diesel, as an economic good, is *normal* and *ordinary*. As for most such goods and services, change in quantity of diesel demand depends essentially on changes in (a) its own price, (b) disposable income, (c) price of complements, (d) price of supplements, and (e) price of alternatives / substitutes. The impact of changes in own price is summarised in the measure of own-price elasticity of demand. The impact of changes in disposable income is summarised in the measure of income elasticity of demand. The impact of changes in prices of complements, supplements, and substitutes are included in the respective measure of cross-price elasticity of demand.

The *complementary* goods for diesel are those that use it as fuel (for example, motor vehicles, railway engines, motorised vessels, pump-sets, generator-sets; *cf. section 1* on uses of diesel). In the present state of technology, there often is high degree of technological specificity precluding alternative fuel-use. This imparts strong complementarity in demand for diesel (or indeed any fuel). The existing stock of such complementary goods, that principally use diesel as input / fuel, constitutes a very large constituency of economic agents. Feasibility of reform options is strongly influenced by their strength in the political-economy. Unfortunately, weaknesses in the institutional mechanism have led to growth in both intensive and extensive use of diesel.

As different from complementary goods, *supplementary* goods for diesel may constitute of specialised equipment that capture desirable / undesirable by-products from diesel exhaust. In particular, transport vehicles entail certain retrofits to capture and minimise particulate and non-particulate emissions.

Substitutes for diesel constitute of other fuels (including kerosene, motor spirit / gasoline / petrol, LPG, natural gas, coal, electricity). But, most complementary goods currently using diesel as input / fuel also entail significant retrofitting to enable compatibility with

[30] The **base weighted price index** or **Laspeyre's price index.** This index concentrates on measuring price (p) changes from a base year. It is called a base weighted index because one uses the quantities (q) purchased in the base year to weight the unit prices in both years. Keeping quantities constant means that change in expenditure is solely due to price changes. The Laspeyre's price index is given by $(\sum p_n q_o / \sum p_o q_o) \times 100$, where, the subscript n refers to the n^{th} period and o refers to the base period.

substitutes. Often, substitution with or transition to, alternative / substitute fuel use may be prohibitively costly and therefore 'unviable'. It is only in recent years that vehicles and engines with multiple-fuel storage and use capabilities are being viably produced for use of alternative fuels.

In *section 2*, this report discusses sector / activity wise consumption of diesel. It appears that most of diesel is utilised for intermediate demand (as input in some production activity). Less than four per cent of total diesel consumption is for final demand.[31] Ghosh (2010) however, analyses the relationship between aggregate (intermediate plus final demand) consumption of diesel and GDP growth in India for the period between 1972-3 and 2005-6. The estimation method using co-integration and error-correction techniques respectively yield long-run and short-run elasticity (*Table 10*). While, estimates of income elasticity for HSD demand is generally low, the estimate on price elasticity of demand is statistically insignificant (not shown here).

Table 10: Elasticity of Demand in India

Elasticity	Gasoline, 1972-94		HSD, 1972-2006
	Income	Price	Income
Long-run	2.682	-0.319	1.27
Short-run	1.178	-0.209	0.46

Source: Gasoline: Ramanathan, R. (1999); HSD: Ghosh (2010).

Ramanathan (1999) estimated the income and price elasticity of gasoline (motor spirit / petrol) demand in India for the period between 1972 and 1994. Unlike for HSD, almost entire gasoline is utilised for final consumption to drive private vehicles (including two-wheelers). Both short- and long-run price elasticities of gasoline demand in India are lower than that for higher income countries like Denmark and Kuwait (estimated using analogous methods). However, income elasticity of gasoline demand is estimated to be much higher than that for Kuwait. This may be due to a combination of factors including, (a) high technological specificity between the fuel used and the ignition system, constituting strict complementarity that may be prohibitively costly to retrofit, (b) rapid rise in petroleum energy intensity of GDP. It is likely that, in the short-run, price elasticity of diesel demand may be lower than that for gasoline.

In an earlier paper, Jha and Mundle (1987) estimate partial and total price response elasticity, that is, the impact on WPI of changes in administered prices of select commodities. The elasticity (or direct impact) of WPI due to changes in price of crude oil and / or petroleum products is about 0.11. And, the total impact on WPI is estimated to be about 0.14 (that includes the indirect impact through linkages with other sectors). These estimates are based on the I-O tables of Planning Commission for the year 1984-85 (at 50-sector classification).

[31] CRISIL (2012) suggests that only about seven per cent of HSD used for road-transportation is consumed by private (personal use) vehicles.

6.3 Fuel Prices and Macroeconomy

There is relative dearth of studies that assess the macroeconomic impact of price changes in diesel or of other specific fuels. Bhattacharya and Bhattacharya (2001), Bhattacharya and Kar (2005), Kumar (2005), and Bhattacharya and Batra (2009) have reported varying impact of rise in oil prices on economic growth rate (decline of one to three per cent) and inflation (increase between 6.5 and 18 per cent).

Bhanumurthy *et al* (2012) have developed a macroeconomic model at NIPFP. They analyse the impact of a large upward revision in international price of (crude) oil. In particular, they study scenarios for differing degrees of pass-through onto domestic prices. However, it is pertinent to recall that the parameters supporting the model relations are derived from econometric exercises that are often stable (or robust) only under marginal formulations.

Crude estimates from Leontief Inverse Demand Matrix[32] derived from Input-Output (I-O) tables (130-sector classification in 2003-4) for the Indian economy shows that, for a given increase in final demand, the output of petroleum products needs to rise almost four times as much compared to the average output increase.[33] Analogous computation from the 1983-4 I-O tables (at 115-sector classification), estimated the required average output increase of nearly three units of petroleum products for a unit increase in final demand.[34]

Thus petroleum products sector depicts strong forward linkage with the remainder of the economy. It may be noted that the average output increase in petroleum products for a given increase in final demand increased by almost one-third (from 2.991 to 4.0461) between 1983-4 and 2003-4.[35]

Intuitively, it is straight-forward that increase in price (of petroleum products) would directly foment inflation. However, it is also believed that a reduction in under-recoveries and subsidies would facilitate a reduction in fiscal deficit that, in-turn, may dampen the overall inflationary impact.

[32] Let, the output equation be given by $q' = Aq' + f'$, where q is the output vector, A is the matrix of input-coefficients and f is the final demand vector. Rearranging, we have $q' = (I - A)^{-1}f'$. The symbol $'$ represents transpose or column vector. The matrix derived from $(I - A)^{-1}$ is the Leontief Inverse Demand Matrix.

[33] The sum of row elements of the inverse demand matrix gives the required increase in output of a given sector (say, petroleum products), for a unit increase in final demand of each sector. The average of the row elements is the average increase in output of petroleum products sector for a unit increase in final demand. This average has been estimated as 4.0461 for the year 2003-4.

[34] The extant sector classification in Indian I-O tables is however, not amenable to derive analogous estimates for specific fuels (say, diesel). It is very likely though that the strength / degree of forward linkage for diesel may be significantly different from (higher than) that for aggregate petroleum products sector.

[35] This in turn indicates an *increase in fossil fuel intensity* of economic activity. But, there is evidence to suggest that energy intensity of GDP in India has declined over the years. Such a situation may transpire from a combination of the following, (a) the use of fossil fuels may be displacing use of non-fossil fuels (like firewood, dung-cake), (b) heat energy from burning of fossil-fuels may be easier to harness and redirect, and (c) technological developments may raise the efficacy of fossil-fuel use. It is perhaps safe to deduce that thermal efficiency at the macro-aggregate level has improved.

6.4 Impact of Changes in Tax Administration on Revenue from Petroleum Products

Table 5 showed that price build-up for diesel in the domestic Indian economy has elements of both *ad-valorem* and specific duties. During episodes of rising prices (of Crude and therefore petroleum products) *ad-valorem* rates of duties and taxes would increase government (tax) revenues. But, an upward revision in diesel prices is likely to aggravate the adverse impact of inflation, especially on employment and inequality. In contrast, specific duties may be useful in assuring revenue mobilisation for governments even during episodes of declining / falling prices (of crude, given relatively low price elasticity of demand).[36]

Section 4 of this report highlighted the continued and heavy dependence of governments, both at the federal and provincial levels, on taxes from petroleum products. Limited administrative capacity, both technological and personnel, to withstand changes, is a major constraint to implement a broad-based tax on value-added in goods and services in the economy. This has weakened the constituency for far-reaching reforms in administration of indirect taxes.

The build-up of value-addition in petroleum products reveals that most of it happens in the crude stage. The ratio of value-added : value-of-output, in *Refining of Petroleum Products* was as low as five per cent in 1983-4.[37] Similar, estimates for the year 2003-4 shows that value-addition was less than eight per cent. Data from Annual Survey of Industries[38] shows value-added as constituting about 10 (16) per cent of value of output in the year 2009-10 (2008-9).

Table 11: Cost of Inputs (CoI), Value of Output (VoO) and Gross Value Added (GVA) in Refining of Petroleum Products, (value in billion INR)

Year	Cost of Inputs	Value of Output	Gross Value Added (%)
(1)	(2)	(3)	(4) = [(3)-(2)]/(3)
1999-2000	483.2	543.0	11.02
2000-1	663.3	747.5	11.27
2001-2	890.8	998.9	10.82
2002-3	1217.8	1429.9	14.83
2003-4	1450.4	1727.8	16.06

[36] In India, specific duties of excise were slowly transformed into *ad-valorem* rates starting in the mid-eighties, and by early-nineties a majority of goods were subjected to *ad-valorem* rates. This was also true for crude and petroleum products. However, when international prices of crude started declining around mid-nineties, resource mobilisation of governments (both federal and provincial) began to dwindle. With gathering momentum to dismantle the APM, the federal government found it opportune to revert to a system of specific duties to prevent erosion of revenue.

[37] This is estimated from the I-O transactions table for the Indian Economy published by the Central Statistical Organisation). In the year 1983-4 value-added at the (production of) mineral (*crude*) stage was almost 88 per cent of the value of output of that sector (*crude petroleum and natural gas*). For this sector (combined *crude petroleum and natural gas*) in the year 2003-4, value-added was only about 28 per cent of the gross value of output.

[38] See GoI, 2011 and GoI, 2010 for *Manufacture of Petroleum Products* (NIC-1998, 3-Digit: 232; NIC-2004, 3-Digit: 232; NIC-2008, 3-Digit: 192).

Year	Cost of Inputs	Value of Output	Gross Value Added (%)
(1)	(2)	(3)	(4) = [(3)-(2)]/(3)
2004-5	1957.5	2284.4	14.31
2005-6	2403.2	2862.2	16.04
2006-7	3110.6	3662.0	15.06
2007-8	3568.0	4251.2	16.07
2008-9	3923.4	4657.4	15.76
2009-10	4596.9	5115.3	10.13

Source: Basic data from http://mospi.nic.in/

Table 11 gives the GVA as per cent of VoO for the years between 1999-2000 and 2009-10. The GVA varies between 10.13 per cent (2009-10) and 16.07 per cent (2007-8) with period average of 13.76 per cent.

While not reporting directly, GoI (2006) indicates that value-addition in *Manufacture of Petroleum Products* may be in the range of 10 per cent.[39] But, working back from the estimates of effective rate of protection (ERP) reported there,[40] it turns out that value-added may be about 14-15 per cent (or one-seventh) of the value of output.

Note that, VoO = CoI + GVA. Assuming GVA to be about 14 per cent of VoO, CoI may then be about six times the GVA. In the extant regime, petroleum taxes are imposed on either CoI or VoO, and not on GVA. If *ad-valorem* rate of tax be (say) *x* per cent, then tax revenue mobilised is CoI*(*x*/100) ≅ (6*GVA)*(*x*/100). Thus, a shift to an indirect tax administration based (only) on taxation of value-added, and also intending to protect revenues (revenue neutrality from respective sectors) may likely entail imposition of a significantly higher rate of *ad-valorem* tax. Specifically for the petroleum sector, this may be almost six times the extant rate.

It is possible to mould the administration of petroleum sector taxes to accommodate the sectoral revenue target. This may constitute two components. *First* a *normal* rate, as for the rest of goods and services that is eligible for input-tax credit, and *second* a non-creditable *additional rate* of tax. It is likely that, given the extant design of Indian indirect taxes, this *additional rate* on the petroleum sector may be five times the *normal* rate of tax on value-added.

7 Input Costs of Diesel and / or Petroleum Products: Some Examples

The intensity of diesel-use as input (quantity or value) into production of outputs differs significantly across sectors. Thus an increase or revision in the price of diesel would impact different sectors to varying degrees. In the sub-sections below, we estimate the use of diesel

[39] See, GoI, 2006, footnote 1, on page 1, "Refining of crude oil is a process industry where crude oil constitutes around 90% of the total cost."

[40] *Op cit*, para 12, page 6, "The customs duty on ……which translates to an effective rate of protection as high as 40% for these products." ERP is the ratio of value-added at domestic prices to the value-added at world prices. If tradable input coefficients are denoted by m_{ij} and tariff rate on commodity i by t_i, the effective tariff g_j on commodity j is given by, [$g_j = (t_j - \sum_i(m_{ij}t_i) / (1 - \sum_i(m_{ij})$] and ERP is given by $1 + g_j$.

fuel by certain identifiable uses, users, and consuming sectors. We utilise this input cost proportion due to diesel and assess the increase in total input cost, under *ceteris paribus* conditions from a 25 per cent increase in price of diesel.[41] The limited intent of this section is to assess only the *direct impact* of rise in diesel price on total input cost for some sectors.

7.1 Public Transportation of Passengers by Road

The State Road Transport Corporations (SRTCs) are one of the principal suppliers of intra- and inter-state passenger transport services in the public sector. *Table 12* presents the cost of fuel and lubricants consumed by certain SRTCs. Diesel is the commonly used fuel for a large majority of SRTCs.

Table 12: Total and Fuel Cost per km. for SRTCs

State Road Transport Undertaking	Total Cost per km. (Paise)		Fuel and Lube Cost / Total Cost (percent)		Fuel Efficiency (kmpl of HSD)	
	2010-1	2009-10	2010-1	2009-10	2010-1	2009-10
Ahmedabad MTS	4725.16	3913.70	12.92	12.04	3.47	3.47
Andhra Pradesh SRTC	1893.66	1737.13	34.38	31.81	5.17	5.28
B.E.S.T Undertaking	5713.45	5664.55	22.57	18.41	2.91	2.94
Bangalore Metropolitan TC	2792.44	2414.43	39.37	39.31	4.01	4.11
Bihar SRTC	2793.34	4124.82	34.76	26.55	4.18	4.04
Calcutta STC	7212.90	5628.99	17.60	19.67	3.37	3.48
Chandigarh TU	3391.78	3358.04	27.15	25.82	4.09	4.04
Delhi TC	11131.17	12828.99	9.15	6.26		4.24
Gujarat SRTC	2244.10	2039.84	33.45	32.19	5.53	5.55
Haryana ST	2994.51	2678.63	25.83	25.30	4.78	4.80
Karnataka SRTC	2315.92	2014.07	38.92	39.56	4.85	4.84
Kolhapur MTU	3158.90	3050.69	38.17	38.13	3.58	3.58
Maharashtra SRTC	2576.67	2277.05	33.09	33.16	4.94	4.96
Meghalaya STC	5049.87	3717.94	16.51	21.00	3.97	4.24
Metro TC (Chennai) Ltd.	3292.74	2748.01	28.07	29.20	4.39	4.46
Mizoram ST	12794.46	15450.33	8.37	9.50	3.47	3.33
Nagaland ST	4409.34	4209.86	18.39	21.53	3.76	3.75
Navi Mumbai MT			34.36	36.24		

[41] This increase corresponds to the required rise to eliminate under-recovery (*section 4.1*).

State Road Transport Undertaking	Total Cost per km. (Paise)		Fuel and Lube Cost / Total Cost (percent)		Fuel Efficiency (kmpl of HSD)	
	2010-1	2009-10	2010-1	2009-10	2010-1	2009-10
North Bengal STC	5079.75	3829.53	23.10	24.93	4.21	4.22
North Eastern Karnataka RTC	2028.41	1829.32	40.70	39.23	5.25	5.27
North Western Karnataka STC	2204.55	1956.12	38.89	38.87	5.03	5.01
Orissa SRTC	1813.66	1551.51	51.44	52.79	4.54	4.46
PUNBUS, Chandigarh	2172.13	2135.54	38.00	34.22	4.49	4.44
Pune Mahamandal					3.37	3.48
Punjab Roadways	4728.76	5148.34	18.15	14.76	4.55	4.44
Rajasthan SRTC	2383.87	1982.66	31.21	31.67	5.05	5.04
South Bengal STC	3802.46	3602.45	26.24	31.56	4.05	4.08
State Exp. TC TN Ltd.	2340.99	2054.82	34.19	34.99	5.03	4.95
Thane MTU	4652.42	4301.61	27.93	20.65	2.68	3.26
TN STC (Coimbatore) Ltd.	2345.61	1977.93	34.84	36.01	5.01	5.04
TN STC (Kumbakanam) Ltd.	2022.34	1745.71	36.77	37.49	5.52	5.52
TN STC (Madurai) Ltd.	2184.07	1588.64	34.31	34.11	5.47	5.44
TN STC (Salem) Ltd.	2009.84	1751.57	37.32	37.69	5.46	5.44
TN STC (Villupuram) Ltd.	1975.29	1740.03	37.35	37.12	5.54	5.54
Uttar Pradesh SRTC	1975.29	1627.30	31.89	35.35	5.30	5.33
Total (Reporting SRTUs)	2018.74	2217.29	31.15	30.57		

Source: Government of India (2011), Review of the Performance of State Road Transport Undertakings (SRTUs): Passenger Services for April 2010 to March 2011, Ministry of Road Transport and Highways, Transport Research Wing, New Delhi, October 2011. http://morth.nic.in/showfile.asp?lid=775 downloaded on February 08, 2012.

Notes: kmpl: kilometres per litre; One Hundred Paise equal One Indian Rupee

The fuel economy in 2010-1 varied between 2.68 (Thane MTU) and 5.54 (TN STC (Villupuram) Ltd.) kilometres per litre of HSD while, the median rate was 4.54 kilometres per litre. Importantly, it is also seen that fuel costs constitute a rising proportion of total costs in 2010-1 as compared to 2009-10. Overall, for the set of SRTCs in *Table 12*, this increased from 30.57 per cent in 2009-10 to 31.15 per cent in 2010-1. G**iven this average proportion of fuel in total input costs of passenger transport in the public sector, if price of diesel were to be revised upwards by 25 per cent** (to eliminate under-recovery of the OMCs on account of diesel sales, *cf.* section 4.1)**, then *ceteris paribus*, it would raise the total input cost for SRTCs by about eight per cent.**

Table 12 shows that the cost of fuel as a proportion of total costs varies significantly across different SRTCs. For the reporting STUs in 2010-1, it varied between 8.37 to 51.44 per cent for Mizoram and Orissa respectively.[42] Thus an increase in input costs from diesel price increase would also depict a commensurate variation across the differing SRTCs (possibly between 2 and 14 per cent).

It is perhaps safe to assume that input cost increases to produce goods and services are passed-through to the retail sale prices. But, the speed and degree of output price increase because of rise in input costs (say, diesel) is critically determined by the nature of ownership (public or private) of dominant entity supplying the good or service. The share of public *vis-à-vis* private sector in passenger road transport diverges significantly across states. However, public sector freight transport is monopolised by railways while private sector operators predominate freight transport by road. These are analysed briefly in the following sub-sections.

7.2 Goods / Freight Transportation by Road

The National Road Transport Policy formulated by the Ministry of Road Transport and Highways in the Union Government (see para 13.3, pg 28, http://morth.nic.in/writereaddata/sublinkimages/Road_Transport_Policy27333191.pdf) notes that,

> "As of now there is no mechanism in place which would provide regular data on freight and haulage (ton kilometer) and; passengers and distance carried (passenger kilometer) by the private sector operators in road transport sector. No comprehensive data on freight movement is available to indicate origin, destination, type and size of freight carried on roads by motorised transport."

Sriraman *et. al* (2006) in their report, submitted to the Competition Commission of India on Road Goods Transport Industry, lament that (see Annexure V on Data Issues, pg 140), "..[D]ata problems have been severe……..the Industry has …..been almost exclusively in the private sector." However, in the report (see Annexure I on pg 123) they present an example of a model cost of operations for a (16 ton gross vehicle weight) truck. Their estimates suggest that fuel (diesel) cost constitutes almost 80 per cent of variable costs of truck operation. Seen differently, fuel constituted about 36 per cent of (annual) total cost of truck operation. World Bank (2005, *Table 1.3* and *1.4* pg 12) estimates that fuel costs constitute about 43 per cent of the annual expenses for a 16 ton truck.

Based on the patchy evidence for input cost of goods transportation by road, the average proportion of fuel in input cost is about 40 per cent. Thus, an **increase of about 25 per cent in the price of fuel, commensurate with the desired price to eliminate under-recovery, would raise the total input cost of this service by 10 per cent**.

[42] The strikingly low proportion of fuel cost in Delhi TC is due to the use of relatively subsidised compressed natural gas (CNG) for its city transport services.

7.3 Rail Transport

Coal, diesel and electricity are the three important fuels used for railway traction in India. In 2000-1, Diesel accounted for 58 per cent of total traction in *engine-kilometres*. With little addition in new track-length and gradual electrification of existing tracks, diesel traction is on the decline. This proportion reduced at the rate of one percentage point per annum to reach 54 per cent in 2004-5. By 2008-9, the proportion of total traction of engine kilometres using diesel had fallen further to 50 per cent. However, this proportion has remained unchanged in the years 2009-10 and 2010-1.

Output of railway transport services is commonly expressed in *gross tonne-kilometres*. On this measure, the proportion of total traction for passenger transport using diesel declined from 55 to 52 per cent between 2004-5 and 2009-10 (*Table 13*). During the same period, proportion for freight transport also declined but only from 37 to 36 per cent. Thus, overall (for passenger plus freight), the proportion of total traction (in *gross tonne-kilometres*) using diesel declined, but only from 43 to 42 per cent (the year 2008-9 however, reported a sharper decline to 40 per cent).

Table 13: Diesel Use in Railways Traction

Year	2004-5	2005-6	2006-7	2007-8	2008-9	2009-10	2010-1
Diesel out of Total Traction, Per Cent of *Engine kilometres*	54	54	53	52	50	50	50
Passenger Transport, Diesel out of Total, Per Cent of *Gross tonne-kilometres*	55	55	54	54	52	52	
Freight Transport, Diesel out of Total, Per Cent of *Gross tonne-kilometres*	37	37	37	36	35	36	
Passenger Plus Freight, Diesel out of Total, Per Cent of *Gross tonne-kilometres*	43	43	43	42	40	42	
Per Cent of *Diesel Cost* out of *Total Ordinary Working Expenses*	15	18	19	18	14	12	
Per Cent of *Diesel Cost* out of *Total Gross Expenditure*	12	13	14	13	11	10	

Source: (a) Government of India (2012), Annual Report & Accounts, 2010-11, Railway Board, Ministry of Railways and back issues; (b) Government of India (2011), Annual Statistical Statements, 2009-10, Railway Board, Ministry of Railways, and back issues. http://www.indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1,304,366,554,941

Notes: Total traction includes broad-, meter-, and narrow-gauge rail using coal (steam), diesel, or electricity. Total gross expenditure equals total working expenses and includes (a) total ordinary working expenses and (b) contributions to reserve funds (depreciation fund, pension fund etc.).

In the year 2004-5, cost of diesel constituted about 15 per cent of total ordinary working expenses and 12 per cent of gross total expenditure of railways. As a proportion of gross total expenditure, diesel cost rose to about 14 per cent in 2006-7, but subsequently has declined slowly and in 2009-10 constituted only 10 per cent. Given this, **an increase of about 25 per cent in price of diesel, *ceteris paribus*, would likely raise gross total expenditure of railways by only 2.5 to 3.5 per cent**.

7.4 Industry

The Annual Survey of Industries (ASI) for the year 2007-8, provides data on value of output, inputs, capital employed, employment etc. as per the new industrial classification of 2004 (NIC 04). Data on fuels consumed is further classified into coal, electricity, petroleum products. However, further classification of petroleum products into distillates / refined products is not available. *Table 14* presents summary statistics, on petroleum products as a proportion of fuels consumed, for the Indian industrial sectors (see Appendix Table A for details on individual industries at 3-digit classification).

Table 14: Input Cost of Petroleum Products into Industrial Sectors, 2007-8

Industry Code	Industry Description	Cost of Petroleum Products as Percentage of Cost of		
		Total Fuels	Total Inputs	Total Output
All India	**All Industries Combined**	18.97	1.11	0.89
	Mean	30.11	1.39	1.06
	Median	28.69	1.01	0.76
	Maximum	80.83	10.86	7.93
	Minimum	10.70	0.12	0.11

Source: Author's estimates. Basic data from Annual Survey of Industries, GoI, 2011

Summary statistics show that, on an average, petroleum products constitute about 30 per cent of fuels consumed and about 1.39 per cent of total inputs. From *appendix E*, we note that mining and quarrying (142), manufacture of man-made fibres (243), manufacture of glass and glass products (261), manufacture of non-metallic mineral products (269), manufacture of aircrafts and space-crafts (353), and recycling of non-metal waste and scrap (372) are the only industrial sectors where petroleum products constitute more than 3 per cent of total inputs consumed. *Table 14* also shows that compared to the *mean* there is a wide *range* (difference between maximum and minimum) for fuel costs across sectors. It is therefore appropriate to use median as the measure of central tendency.

Given that median value for cost of petroleum products as a proportion of total inputs is about one percent only (*table 14*), **an increase in fuel-price of about 25 per cent or so, to eliminate under-recovery of OMCs in marketing of diesel, would raise the total input cost of the industrial sectors by only about one quarter of a per cent**.[43]

7.5 Agriculture

The Commission for Agricultural Costs and Prices (CACP) advises the GoI on agricultural price policy. There are 25 agricultural commodities[44] for which GoI fixes the minimum support price (MSP). Some Indian provinces also commend a state advised price (SAP). In addition there may be a provincial procurement policy for certain agricultural products (e.g., onion in Maharashtra). Apart from cost of production, the MSP (or its new avatar, fair and remunerative price) is based on considerations for (a) international prices, (b) inter-crop price parity, (c) terms of trade, etc.

Appendix II of GoI (2000) describes the procedure adopted for computing various costs under a comprehensive scheme for studying the cost of cultivation of principal crops. The specific items cover paid-out (out of pocket) and imputed costs. The items covered under *paid-out costs* are, (i) hired labour (human, animal and machinery), (ii) maintenance expenses on owned animals and machinery, (iii) expenses on material inputs such as seed (home grown and purchased), fertiliser, manure (owned & purchased), pesticides and irrigation, (iv) depreciation on implements and farm buildings (such as cattle sheds, machine sheds, storage sheds), (v) land revenue, and (vi) rent paid for leased-in land. *Imputed costs* are assigned to (i) value of family labour / managerial inputs of the farmer, (ii) rent of owned land, and (iii) interest on owned fixed capital for which the farmer does not incur any cash expenses.

In agriculture, diesel is chiefly used to run farm machinery and equipment (including tractors, harvesters), and water-pump sets. Often these are afforded by relatively larger landowners and / or richer farmers. However, as described in the preceding paragraph, the input costs of diesel or petroleum products is imbedded in cost of hired machine labour and maintenance expenses on owned machinery. The costs are generated following certain cost concepts.[45]

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[43] This further assumes that petroleum products utilised in industry constitute of only diesel. *Ceteris paribus*, a 25 per cent increase in price of diesel would raise total input costs by 25*1.01/100 = 0.25 per cent. If diesel use in industry is assumed to constitute the same proportion out of petroleum products, as that for the aggregate economy (namely 38 per cent) then, the rise in total input costs from a 25 per cent increase in price of diesel would be 25*.01*.38= 0.095 per cent only.

[44] These are *sugarcane, copra (milling, ball), jute (tossa, white), mesta, paddy, jowar, bajra, maize, ragi, tur (arhar), moong, urad, groundnut, soyabean, sunflowerseed, sesamum, nigerseed, cotton, tobacco, wheat, barley, gram, masur (lentil), rapeseed / mustard, and safflower*.

[45] Costs are generated following certain cost concepts. Cost *A1* includes (i) value of hired labour, (ii) value of hired bullock labour, (iii) value of owned bullock labour, (iv) value of owned machinery labour, (v) hired machinery charges, (vi) value of seed (both farm produced and purchased), (vii) value of insecticides and pesticides, (viii) value of manure (owned and purchased), (ix) value of fertilizer, (x) depreciation on implements and farm buildings, (xi) irrigation charges, (xii) land revenue, cesses, and other taxes, (xiii) interest on working capital, (xiv) miscellaneous expenses (artisans etc.) Cost *A2* equals cost *A1* plus rent paid for leased-in land; Cost *B1* equals cost *A1* plus interest on value of owned fixed capital assets (excluding land); Cost *B2* equals cost *B1* plus rental value of owned land (net of land revenue) and rent paid for leased-in land; Cost *C1* equals cost *B1* plus imputed value of family labour; Cost *C2* equals cost *B2* plus imputed value of family labour; Cost *C2** equals cost *C2* plus additional value of human labour based on use of higher rate i.e., statutory wage rate or the

Publications of the ministry of agriculture like, cost of cultivation of principal crops in India report the value for cost-concepts by specific crops in major cultivating provinces. There are 14 elements of cost included in the cost concept *A1*, and only two of these (namely, iv and v in footnote 45) are relevant to derive an estimate for fuel-input cost in agriculture. This form of data is cumbersome to utilise in extant analysis.

However, the break-up of cost of cultivation per hectare categorised into operational and fixed costs is also available for specific crops. The *operational* cost is further grouped into labour (human, animal and machine), material (seeds, fertiliser, manure, insecticides), and service (irrigation, interest) categories. Depreciation on implements and farm buildings are included in *fixed* costs that also consist of rental value of owned land, rent paid on leased-in land, land revenue, cesses, and taxes, and interest on fixed capital. The latter categorisation of cost of cultivation appears to be more amenable for use in extant analysis.

Table 15: Operational Cost of Machine Labour as Percentage of Total Cost per Hectare

Crop ⇒	**Wheat[#1]**		**Sugarcane[#2]**	
Agricultural Year ⇒	**2008-9**	**2009-10**	**2007-8**	**2008-9**
Summary Statistic ⇓				
Minimum	3.3	3.7	0.6	1.5
Maximum	14.8	15.0	10.5	7.4
Average	11.2	10.6	3.3	2.6
Median	12.3	10.6	2.1	2.0

Source: Basic data from Reports of the CACP, GoI.

Notes: #1: 13 provinces namely, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, West Bengal; #2: Seven provinces namely, Andhra Pradesh, Haryana, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh, Uttarakhand;

Machine labour input may vary significantly among differing crops in a province, as well as across regions for a given crop. This may depend on several factors including size of landholding, degree of mechanisation in agricultural activities, etc. While details are not clear, it appears that operational cost of machine labour essentially pertains to fuel and lubricants for mechanised agricultural implements and equipment including water-pumps.

actual market rate (this is an intermediate concept); Cost *C3* equals cost $C2^*$ plus 10 per cent of cost $C2^*$ to account for managerial input of the farmer.

For example, *Table 15* presents the cost of machine labour as a percentage of total cost for two crops namely, *wheat* and *sugarcane*.

For the harvest years 2008-9 and 2009-10, on an average, machine labour constitutes about 11 per cent of total cost of wheat cultivation. In contrast, for sugarcane on an average, machine labour constitutes only three per cent of total cost of cultivation. Assuming all machine labour to constitute of only diesel gives the upper bound for the cost of diesel intotal cost of cultivation. *Ceteris paribus*, then **a 25 per cent increase in price of fuel (diesel) would affect an increase of about 2.75 and 0.75 per cent in total cost of cultivation of wheat and sugarcane respectively**.

8 Summary and Conclusions

Diesel is used as input in activities that together account for about two-fifths of Indian GDP. It is rapidly consolidating its pre-eminent position among petroleum-products and constitutes about two-fifths of total consumption of petroleum-products. But, 65 per cent of diesel is utilised in transportation sector that accounts for about 6.6 per cent of GDP. Close to four-fifths of diesel is sold from *retail* outlets, and consequently the impact of price changes are rapidly transmitted in the macroeconomy. This is particularly disconcerting when large chunks of the economy operate in informal markets. In India this encompasses almost the entire agricultural sector, a huge proportion of both passenger and goods transportation by road, and a large proportion of industry. In such situations, increase in output prices tends to overshoot cost increase from price rise of inputs (say, diesel) by huge margins and gives rise to rent-seeking or profiteering.

More than one-half of diesel utilised in the transportation sector, is consumed by trucks. But, diesel consumed per net tonne-kilometre by trucks is almost four times as much by railways (GoI, 2010a). Despite this fuel-cost (efficiency) advantage, in the near term, railways are unlikely to gain share in passenger and freight transportation. The current transport-mode mix leans heavily towards roads that cater to 85 per cent of passenger and 70 per cent of freight traffic. Potential to improve efficiency in diesel-use in road-transportation is of the order of 25 per cent from improved administration of provincial institutions (for example, check-post management). Improvement in average speed of transit from improved road infrastructure would not only raise fuel-efficiency but also trigger cost-reduction on maintenance and staffing.

Hydrocarbon Vision-2025 envisions *energy security* by achieving self-reliance through increased indigenous production and investment in equity oil abroad. But, such perception on security from reliable availability may need to be supplemented with sustainable consumption pattern, and complemented with pricing policies that reflect true opportunity costs. The vision makes an unequivocal call to “phase out existing subsidies as soon as possible” and further to “transfer (a) freight subsidy on supplies to far flung areas, and (b) subsidies on products, to the fiscal budget”. But, precise actions at grass-roots level have remained mired in controversy.

The fiscal subsidy in federal government budget is merely a fraction of the so-called 'under-recovery' of OMCs. The description of 'under-recovery' of OMCs corresponds to the difference between a target price and actual price that may be categorised as 'deficiency payment'. In this sense 'under-recovery' in diesel (and petroleum products, in general) could qualify under WTO ASCM Article 1 definition of *subsidy* (as interpreted by Global Subsidies Initiative, 2010, pp 4).

The under-recovery arises out of the difference between 'refinery transfer price' and the 'depot price'. The former is the 'shadow price faced' by the refiners, while the latter is the price charged by them. The refinery transfer price is currently based on a concept of 'trade parity pricing' that has weak theoretical grounding. Economic theory suggests that prices of goods, including natural resources, should reflect their true opportunity cost (often used interchangeably to denote social or shadow cost). The opportunity cost for a tradable are thus based on border prices. Appropriate border price for an exportable is the FOB price and that for an importable is the corresponding CIF price. Over years, India has emerged as a competitive exporter of refined petroleum products, including diesel. The export parity price may be the appropriate benchmark to set domestic prices.

Theoretical results are often based on assumption of (near) perfectly competitive conditions in the international markets. But, in reality, these markets may not conform to such assumptions. Domestic political-economy concerns may, then, significantly influence pricing policy, especially for non-renewable resources like petroleum products.

Between 2005-6 and 2011-2, fiscal subsidy varied between 25.5 and 30.2 billion INR, while under-recovery varied between 400 and 1385.4 billion INR. Despite apparent 'hardship' imposed on OMCs due to these under-recoveries, they report high profitability and also contribute to the exchequer (in the form of corporation taxes and dividend payments). The maze of transactions between (a) government budget and OMCs and (b) among public sector E&P and OMCs, in particular, has done precious little to promote transparency in public accounting.

If reported under-recovery in diesel were to be eliminated without affecting the tax revenue (in turn, by adjusting the specific excise duty and / or the *ad-valorem* sales tax rate) and the dealer commission, then the final retail price may rise by 25 per cent (to 51.08 INR per litre compared to 40.91 INR per litre as on November 16, 2011). But if reported under-recovery were to be eliminated by changing only the dealer price (and retaining both specific excise duty and the *ad-valorem* sales tax rate), then the final retail price would rise by about 28 per cent (to 52.32 INR per litre). This additional three per cent increase in retail price is purely on account of *ad-valorem* rate of sales tax which translates into revenue gain for the provincial government.

As the *ad-valorem* (provincial) sales tax rate is imposed on the sum of dealer price, dealer commission and (federal) excise duty, the final retail price has an element of tax on tax (*ad-valorem* sales tax rate on the specific excise duty component). This is the problem of 'cascading' taxes. Cascading in the extant tax administration may be resolved by migrating to

a value-added based system of GST (that allows for input-tax credit). But, a JWG set-up by the ECoSFM recommended that a basket of petroleum products (see GoI, 2008) consisting of crude, MS, ATF and HSD should be kept outside the GST.[46] These excluded products (proposed by the JWG), contribute about 80 per cent of the total tax revenue from the petroleum sector. Exclusion at this scale is likely to defeat the logic of introducing GST, as these products impact on various stages in trade and industry.

Taxes and subsidies cannot be looked-at in isolation, for any given good or fuel. These must, necessarily, be studied in relation to competing and complementary technologies keeping the divergent uses and users at the focal point. In Delhi, use of only CNG in public passenger transport (including buses, taxis and TSRs) was mandated a few years ago. Use of the fuel entailed some retrofitting, but the fuel itself was also subsidised. Often incentive to adopt alternative fuels has morphed into its subsidisation, creating new distortions.

A sustained gap between retail prices of MS and diesel is likely yielding in counter-productive outcomes. Measures aimed at narrowing this gap should be initiated on a priority basis. In the extant case of joint-products that pose specific challenges in apportioning cost of production, price wedges may be based, for example, on differentials in (a) thermal efficiency and (b) combustion residues of the petroleum products. Taxation policy should not negate thermal efficiency of differing fuels. Vehicles powered with engines of similar capacity, but driven using diesel may yield about 30 per cent more mileage, than those driven using motor spirit. Assuming similar level and toxicity of combustion residues from each unit of diesel or motor spirit, the tax differential between the two may be 30 per cent. Currently indirect tax yield per unit of diesel is less than 30 per cent that from motor spirit (a differential of 70 per cent). Further 'dieselisation', under the existing regime, may be detrimental to public finance by lowering revenue yield.

Taxes implemented as specific duties or *ad-valorem* rates may have significantly differing impact when other input prices change. The design may indicate the importance that an administration places on protecting its revenues relative to its objective of stabilising price movements.

The weight of mineral oils in wholesale price index (WPI) has been rising with every revision, in composition of the basket, for its estimation. In particular the weight of diesel in the basket has more than doubled. As a thumb-rule, a 10 per cent increase in diesel prices, with all other prices and demand for commodities remaining unchanged, would cause the general price level to rise by about 0.47 per cent.

Petroleum products sector depicts strong forward linkage with the remainder of the economy. The average output increase in petroleum products for a given increase in final demand, increased by almost one-third (from 2.991 to 4.0461) between 1983-4 and 2003-4. While, energy intensity of GDP is declining, a larger proportion of energy is being sourced from

[46] Off late some newspaper reports suggest that the EGoSFM may be more amenable to include all four excluded items (crude, MS, ATF and HSD) into the GST framework (for example, see http://www.livemint.com/2012/06/17233358/States-agree-to-bring-petroleu.html).

fossil-fuels. But, there is relative dearth of empirics for India relating to impact of fuel price changes on economic variables. Long-run elasticities of demand (price and income) may however be larger in magnitude than short-run elasticities.

If price of diesel were to be revised upwards (by 25 per cent) to eliminate under-recovery of the OMCs, then as per the latest available estimates, total input costs for (a) passenger transport in public sector, (b) freight transport by road, (c) railway transportation service, and (d) industry, would rise respectively by 8, 10, 3, and 0.25 per cent. In agriculture, there is significant heterogeneity in machine labour input across crops and regions. Assuming machine labour to comprise only cost of diesel (fuel and lubricants), an upward revision in its price by 25 per cent would raise the total cost of cultivation of wheat and sugarcane respectively by 2.75 and 0.75 per cent.

Petroleum sector tax administration may be harmonised with GST in the framework of tax on value-added, even while maintaining sectoral revenue (neutrality) target. This may constitute of two components. *First* a *normal* rate, as for the rest of goods and services that is eligible for input-tax credit, and *second* a non-creditable *additional rate* of tax. However, given the extant design of Indian indirect taxes, this *additional rate* on the petroleum sector may be five times the *normal* rate of tax on value-added.

In most developed economies, petroleum products are subjected to special excises (*green tax* corresponding to an additional rate) and there is concerted effort to phase-out remaining subsidies. The extant petroleum products pricing policy in India has contributed to high (and continual) deficit in national accounts. The resultant misallocation of resources undermines growth prospects of the Indian economy.

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Appendices

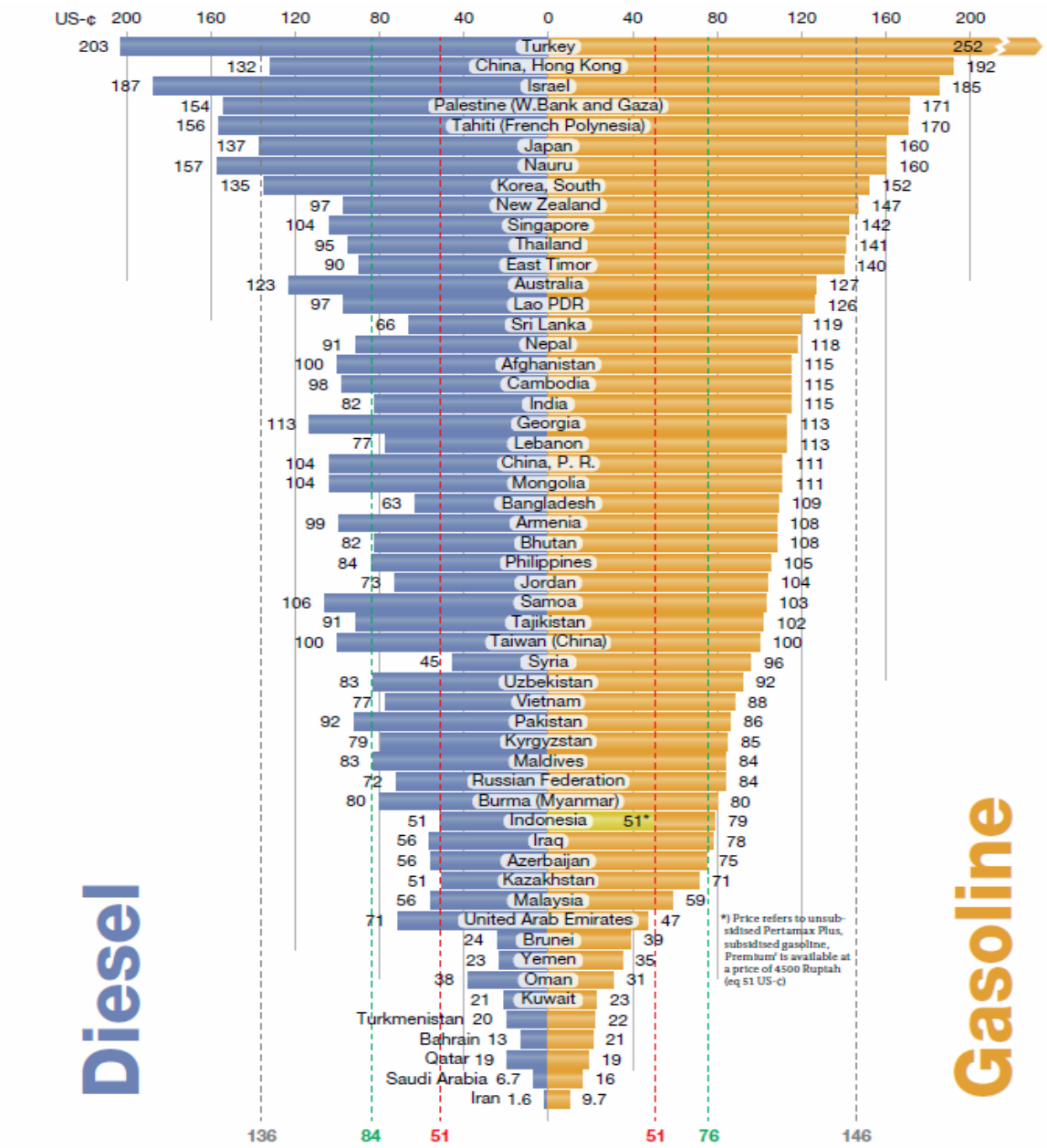
Appendix A: Conversion Factor Table

FACTORS TO CONVERT WEIGHT TO VOLUME, AND VOLUME CONVERSION FACTOR FROM 29.5 °C TO 15 °C		
Product	**Metric Tonne to Litre**	**29.5 °C to 15 °C**
	Multiply by	
AVIATION SPIRIT 100/130	1421	0.9827
AVIATION SPIRIT 114/145	1449	0.9820
AVIATION SPIRIT 73 CLEAR	1432	0.9824
ATF	1288	0.9862
MS 87	1411	0.9830
MS 93	1386	0.9836
HSD	1210	0.9879
SKO	1285	0.9864
LDO	1172	0.9877
FO	1071	0.9899
HEXANE	1457	0.9806
MTO LAWS	1302	-
AROMAX	1221	-
LUBE BASE OILS	1114	-
(SOURCE : INDIAN PETROLEUM & NATURAL GAS STATISTICS, 2007-08 (MOP&NG))		
CONVERSION FACTOR FOR CRUDE OIL, NATURAL GAS & LNG		
CRUDE OIL		
1 Metric Tonne = 1.165 Kilolitres = 7.33 Barrels		
1 Barrel per day = 49.8 Tonnes per year		
NATURAL GAS		
1 Billion Cubic Metre = 0.90 Million tonne oil equivalent(MTOE) = 0.74 Million tonnes LNG		
LNG		
1 Million Tonne = 1.36 BCM Natural Gas = 1.22 Million tonne oil equiv (MTOE)		

CONVERSION FACTOR FOR LPG, GASOLINE, KEROSENE, DIESEL, RFO				
PRODUCT	**Barrels to tonnes**	**Tonnes to barrels**	**Kilolitres to tonnes**	**Tonnes to kilolitres**
LPG	0.086	11.6	0.542	1.844
Gasoline	0.118	8.5	0.740	1.351
Kerosene	0.128	7.8	0.806	1.24
Gas oil / diesel	0.133	7.5	0.839	1.192
Residual fuel oil	0.149	6.7	0.939	1.065

Source: Petroleum Planning and Analysis Cell; BP Statistical Review of World Energy, June 2010

Appendix B: Comparison of Retail Fuel Price in Asia, Australia and Pacific – as of November 2010 (US-cents/litre)



Grey Benchmark Line: Retail price of gasoline and diesel of Romania/Luxembourg. In November 2010, gasoline (diesel) prices in Romania (Luxembourg) were the lowest in Europe. Prices in EU countries are subject to VAT, specific fuel taxes as well as other country specific duties and taxes.

Green Benchmark Line: Retail price of gasoline and diesel in the United States. Cost-covering retail prices incl. industry margin, VAT and incl. approx. US 10 cents for 2 road funds (federal and state). This fuel price being without other specific fuel taxes may be considered as the international minimum benchmark for a non-subsidised road transport policy.

Red Benchmark Line: Price of crude oil on world market.

Source: Reproduced from page 35 of the download at: http://www.giz.de/Themen/en/SID-714C150B-3236E7B6/dokumente/giz-en-IFP2010.pdf. International Fuel Prices 2010/11, 7th Edition, giz.

Appendix C: Price Build-up of Diesel at Delhi

Sr. No.	Elements	Unit	Effective 16th May'12
1	FOB Price at Arab Gulf of Gasoil (Diesel) BS III equivalent	$/bbl	130.12
2	Add: Ocean Freight from AG to Indian Ports	$/bbl	2.22
3	C&F (Cost & Freight) Price	$/bbl	**132.34**
	OR	Rs./Litre	43.73
4	Import Charges (Insurance/Ocean Loss/ LC Charge /Port Dues)	Rs./Litre	0.41
5	Customs Duty @2.58% (2.50% + 3% Education cess)	Rs./Litre	1.14
6	Import Parity Price (at 29.5º C) (Sum of 3 to 5)	Rs./Litre	45.27
7	Export Parity Price (at 29.5º C)	Rs./Litre	42.99
8	**Trade Parity Price** (80% of (6)+20% of (7))	**Rs./Litre**	**44.81**
9	**Refinery Transfer Price (RTP) for BS-III Diesel** (Price Paid by the Oil Marketing Companies to Refineries)	Rs./Litre	**44.81**
10	Add: Premium recovered for BS-IV Grade over BS-III	Rs./Litre	0.04
11	Add : Inland Freight and Delivery Charges	Rs./Litre	0.87
12	Add : Marketing Cost of OMCs	Rs./Litre	0.67
13	Add : Marketing Margin of OMCs	Rs./Litre	0.73
14	**Total Desired Price** (Sum of 9 to 13) -Before Excise Duty, VAT and Dealer Commission	Rs./Litre	**47.11**
15	Less: Under-recovery to Oil Marketing Companies	Rs./Litre	13.64
16	**Price Charged to Dealers (Depot Price)** (14-15) - Excluding Excise Duty & VAT	Rs./Litre	**33.47**
17	Add : Specific Excise Duty @ Rs.2.06/Litre (Rs.2.00/Litre+ 3% Education cess)	Rs./Litre	2.06
18	Add : Dealer Commission	Rs./Litre	0.91
19	Add : VAT (including VAT on Dealer Commission) applicable for Delhi @ 12.50% and Air Ambience Charges @ Rs.250/KL less rebate of Rs.375/KL.	Rs./Litre	4.46
20	**Retail Selling Price at Delhi** (Sum of 16 to 19)	Rs./Litre	**40.91**

Appendix D: Price Build-up of Diesel at Delhi

Sr. No.	Elements	Unit	Effective 1st July'12
1	FOB Price at Arab Gulf of Gasoil (Diesel) BS III equivalent	$/bbl	110.60
2	Add: Ocean Freight from AG to Indian Ports	$/bbl	2.02
3	C&F (Cost & Freight) Price	$/bbl	**112.62**
	OR	Rs./Litre	39.42
4	Import Charges (Insurance/Ocean Loss/ LC Charge /Port Dues)	Rs./Litre	0.37
5	Customs Duty @2.58% (2.50% + 3% Education cess)	Rs./Litre	1.03
6	Import Parity Price (at 29.5º C) (Sum of 3 to 5)	Rs./Litre	40.81
7	Export Parity Price (at 29.5º C)	Rs./Litre	38.71
8	**Trade Parity Price** (80% of (6)+20% of (7))	**Rs./Litre**	**40.39**
9	**Refinery Transfer Price (RTP) for BS-III Diesel** (Price Paid by the Oil Marketing Companies to Refineries)	Rs./Litre	**40.39**
10	Add: Premium recovered for BS-IV Grade over BS-III	Rs./Litre	0.04
11	Add : Inland Freight and Delivery Charges	Rs./Litre	0.81
12	Add : Marketing Cost of OMCs	Rs./Litre	0.67
13	Add : Marketing Margin of OMCs	Rs./Litre	0.70
14	**Total Desired Price** (Sum of 9 to 13) -Before Excise Duty, VAT and Dealer Commission	Rs./Litre	**42.61**
15	Less: Under-recovery to Oil Marketing Companies	Rs./Litre	9.13
16	**Price Charged to Dealers (Depot Price)** (14-15) - Excluding Excise Duty & VAT	Rs./Litre	**33.48**
17	Add : Specific Excise Duty @ Rs.2.06/Litre (Rs.2.00/Litre+ 3% Education cess)	Rs./Litre	2.06
18	Add : Dealer Commission	Rs./Litre	0.91
19	Add : VAT (including VAT on Dealer Commission) applicable for Delhi @ 12.50% and Air Ambience Charges @ Rs.250/KL.	Rs./Litre	4.84
20	**Retail Selling Price at Delhi** (Sum of 16 to 19)	Rs./Litre	**41.29**

Appendix E: Input of Petroleum Products into Industrial Sectors, 2007-8

Industry Code	Industry Description	Petroleum Products as per cent of		
		Total Fuels	Total Inputs	Total Outputs
014	AGRICULTURAL AND ANIMAL HUSBANDRY SERVICE ACTIVITIES, EXCEPT VETERINARY ACTIVITIES	10.70	0.14	0.13
142	MINING AND QUARRYING , N.E.C.	42.03	3.49	2.53
151	PRODUCTION, PROCESSING AND PRESERVATION OF MEAT, FISH, FRUIT VEGETABLES, OILS AND FATS	18.23	0.43	0.39
152	MANUFACTURE OF DAIRY PRODUCT	27.07	0.82	0.76
153	MANUFACTURE OF GRAIN MILL PRODUCTS, STARCHES AND STARCH PRODUCTS, AND PREPARED ANIMAL FEEDS	20.68	0.54	0.50
154	MANUFACTURE OF OTHER FOOD PRODUCTS	32.42	1.36	1.16
155	MANUFACTURE OF BEVERAGES	31.39	1.97	1.24
160	MANUFACTURE OF TOBACCO PRODUCTS	38.04	0.94	0.53
171	SPINNING, WEAVING AND FINISHING OF TEXTILES	13.29	1.53	1.26
172	MANUFACTURE OF OTHER TEXTILES	30.65	1.42	1.16
173	MANUFACTURE OF KNITTED AND CROCHETED FABRICS AND ARTICLES	24.15	1.21	0.95
181	MANUFACTURE OF WEARING APPAREL, EXCEPT FUR APPAREL	41.19	1.20	0.90
182	DRESSING AND DYEING OF FUR; MANUFACTURE OF ARTICLES OF FUR	12.22	1.26	1.10
191	TANNING AND DRESSING OF LEATHER, MANUFACTURE OF LUGGAGE HANDBAGS, SADDLERY & HARNESS	28.69	0.78	0.69
192	MANUFACTURE OF FOOTWEAR	29.48	0.76	0.65
201	SAW MILLING AND PLANING OF WOOD	31.80	0.50	0.45

Industry Code	Industry Description	Petroleum Products as per cent of		
		Total Fuels	Total Inputs	Total Outputs
202	MANUFACTURE OF PRODUCTS OF WOOD, CORK, STRAW AND PLAITING MATERIALS	23.01	1.10	0.92
210	MANUFACTURE OF PAPER AND PAPER PRODUCT	14.24	2.02	1.59
221	PUBLISHING	22.59	0.65	0.43
222	PRINTING AND SERVICE ACTIVITIES RELATED TO PRINTING	27.88	1.06	0.79
223	REPRODUCTION OF RECORDED MEDIA	17.39	0.73	0.50
231	MANUFACTURE OF COKE OVEN PRODUCTS	21.26	0.77	0.58
232	MANUFACTURE OF REFINED PETROLEUM PRODUCTS	63.20	0.83	0.70
241	MANUFACTURE OF BASIC CHEMICALS	12.67	1.54	1.22
242	MANUFACTURE OF OTHER CHEMICAL PRODUCTS	27.94	1.32	0.95
243	MANUFACTURE OF MAN-MADE FIBRES	51.68	6.74	5.72
251	MANUFACTURE OF RUBBER PRODUCTS	19.76	1.33	1.05
252	MANUFACTURE OF PLASTIC PRODUCTS	21.87	1.19	1.00
261	MANUFACTURE OF GLASS AND GLASS PRODUCTS	40.44	10.86	7.93
269	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS N.E.C	11.51	3.57	2.18
271	MANUFACTURE OF BASIC IRON & STEEL	10.89	1.32	0.99
272	MANUFACTURE OF BASIC PRECIOUS AND NON-FERROUS METALS	11.07	1.03	0.82
273	CASTING OF METALS	14.57	1.94	1.61
281	MANUFACTURE OF STRUCTURAL METAL PRODUCTS, TANKS, RESERVOIRS AND STEAM GENERATORS	33.75	0.70	0.56
289	MANUFACTURE OF OTHER FABRICATED METAL PRODUCTS; METAL WORKING SERVICE	33.32	1.97	1.60

Industry Code	Industry Description	Petroleum Products as per cent of		
		Total Fuels	Total Inputs	Total Outputs
	ACTIVITIES			
291	MANUFACTURE OF GENERAL PURPOSE MACHINERY	29.52	0.70	0.53
292	MANUFACTURE OF SPECIAL PURPOSE MACHINERY	30.41	0.57	0.45
293	MANUFACTURE OF DOMESTIC APPLIANCES, N.E.C	24.43	0.40	0.32
300	MANUFACTURE OF OFFICE, ACCOUNTING AND COMPUTING MACHINERY	80.83	1.57	1.28
311	MANUFACTURE OF ELECTRIC MOTORS, GENERATORS AND TRANSFORMERS	25.58	0.25	0.19
312	MANUFACTURE OF ELECTRICITY DISTRIBUTION AND CONTROL APPARATUS	28.80	0.36	0.27
313	MANUFACTURE OF INSULATED WIRE AND CABLE	33.26	0.73	0.63
314	MANUFACTURE OF ACCUMULATORS, PRIMARY CELLS AND PRIMARY BATTERIES	13.76	0.55	0.43
315	MANUFACTURE OF ELECTRIC LAMPS AND LIGHTING EQUIPMENT	25.10	1.31	1.01
319	MANUFACTURE OF OTHER ELECTRICAL EQUIPMENT N.E.C	36.12	0.77	0.64
321	MANUFACTURE OF ELECTRONIC VALVES AND TUBES AND OTHER ELECTRONIC COMPONENTS	14.97	0.49	0.36
322	MANUFACTURE OF TELEVISION AND RADIO TRANSMITTERS AND APPARATUS FOR LINE TELEPHONY & LINE TELEGRAPHY	33.17	0.38	0.29
323	MANUFACTURE OF TELEVISION & RADIO RECEIVERS, SOUND OR VIDEO RECORDING OR REPRODUCING APPARATUS AND ASSOCIATED GOODS	26.68	0.24	0.21

Industry Code	Industry Description	Petroleum Products as per cent of		
		Total Fuels	Total Inputs	Total Outputs
331	MANUFACTURE OF MEDICAL APPLIANCES AND INSTRUMENTS AND APPLIANCES FOR MEASURING, CHECKING,TESTING,NAVIGATING AND OTHER PURPOSES EXCEPT OPTICAL INSTRUMENTS	37.25	0.68	0.49
332	MANUFACTURE OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT	19.82	0.73	0.44
333	MANUFACTURE OF WATCHES AND CLOCKS	30.34	1.01	0.52
341	MANUFACTURE OF MOTOR VEHICLES	46.65	0.56	0.47
342	MANUFACTURE OF BODIES (COACH WORK) FOR MOTOR VEHICLES; MANUFACTURE OF TRAILERS AND SEMI TRAILERS	43.71	1.06	0.86
343	MANUFACTURE OF PARTS AND ACCESSORIES FOR MOTOR VEHICLES AND THEIR ENGINES	34.85	1.40	1.10
351	BUILDING AND REPAIR OF SHIPS & BOATS	34.41	0.42	0.33
352	MANUFACTURE OF RAILWAY AND TRAMWAY LOCOMOTIVES AND ROLLING STOCK	20.14	0.54	0.42
353	MANUFACTURE OF AIRCRAFT AND SPACECRAFT	71.81	5.63	3.75
359	MANUFACTURE OF TRANSPORT EQUIPMENT N.E.C	42.65	1.04	0.83
361	MANUFACTURE OF FURNITURE	35.21	1.41	1.15
369	MANUFACTURING N.E.C	19.78	0.12	0.11
371	RECYCLING OF METAL WASTE AND SCRAP	69.80	1.20	1.14
372	RECYCLING OF NON-METAL WASTE AND SCRAP	63.48	3.78	2.67
OTH	OTHER INDUSTRIES	13.47	0.62	0.51