



IMF Working Paper

The Fiscal and Welfare Impacts of Reforming Fuel Subsidies in India

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Abstract

Rising fuel subsidies have contributed to fiscal pressures in India. A key policy concern regarding subsidy reform is the adverse welfare impact on households, in particular poor households. This paper evaluates the fiscal and welfare implications of fuel subsidy reform in India. Fuel subsidies are found to be badly targeted, with the richest ten percent of households receiving seven times more in benefits than the poorest ten percent. Although subsidy reform would generate substantial fiscal savings, the associated increases in fuel and other prices would lower household real incomes of all income groups. Better targeting of fuel subsidies would fully protect lower income households while still generating substantial net fiscal savings. Lessons from subsidy reforms in other countries are identified and discussed.

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I. INTRODUCTION

Subsidizing consumers of petroleum (or fuel) products is a common phenomenon in many developing and emerging economies, including in India. Fuel subsidies generally arise out of a desire to shield consumers, especially poor households, from high and often volatile fuel costs for lighting, cooking, and transportation. However, fuel subsidies are both inefficient and inequitable (IMF, 2010, 2013). They encourage overconsumption of fuel, delay the adoption of energy-efficient technologies, and crowd out high-priority public spending, including spending on physical infrastructure, education, health and social protection. Most of the benefits of fuel subsidies also go to higher income groups who tend to consume more fuel (Arze and others, 2012). Recognition of these shortcomings has led to an active debate in India as to the merits of replacing these subsidies with better targeted safety net measures.

Fuel subsidy reform has been on the Indian government's policy reform agenda over the last decade.¹ A number of reports have been produced that analyze the approach to fuel pricing in India, the need for fuel subsidy reform, and reform options.² India's government has recently taken a number of measures to reform its fuel subsidy system. In June 2010, petrol pricing was liberalized and the intention to liberalize diesel prices announced. In its 2012/13 budget speech, the government stated its intention to limit all central subsidies (including those on fuels) to less than 2 percent of GDP in 2012/13, and reducing them to under 1.75 percent of GDP over three years. In January 2013, the government announced that oil-marketing companies would have greater flexibility in setting diesel prices and that bulk users of diesel would pay unsubsidized prices. However, the government has yet to set out a clear plan and timeline for reforming remaining fuel subsidies.

This paper evaluates the fiscal and welfare implications of fuel subsidy reform in India, and identifies issues that need to be addressed when designing subsidy reforms. Section II reviews existing analytical work on fuel subsidies for India and other developing and emerging economies. Section III discusses the magnitude of fuel subsidies in India, how they are financed, and the increases in domestic fuel prices required to eliminate subsidies. Section IV evaluates the impact that these prices increases would have on inflation and household real incomes. Section V identifies lessons from country reform experiences for designing successful and durable subsidy reforms, and discusses a possible reform agenda for India. Section VI concludes.

¹ More generally, as a signatory of the G-20 Pittsburgh Communiqué in September 2009, the Indian government has agreed to phase-out energy subsidies. This commitment was reaffirmed at the 2012 Los Cabos meeting of the G-20.

² These include Rangarajan and others (2006), the Parikh Committee Report (2010), the Nilekani Committee Report (2011), and the Kelkar Committee Report (2012).

II. BACKGROUND

A large number of country studies have evaluated the welfare impact of subsidies and subsidy reform. A recent study by Arze del Granado, Coady, and Gillingham (2012) reviews the evidence from a set of 20 developing countries, including available evidence for India.³ They find that most of the benefit of fuel subsidies accrues to the rich: on average, the top income quintile received 6 times more in subsidy benefits than the bottom quintile. Petrol subsidies are the most regressive, with over 80 percent of the total benefits accruing to the top two quintiles. For diesel and liquefied petroleum gas (LPG), respectively, 65 and 70 percent of subsidy benefits accrue to the top two quintiles. Although the benefits of kerosene subsidies accrue more uniformly across income groups, there is still substantial leakage of benefits to higher income groups. The review estimated that increasing fuel prices by \$0.25 per liter results, on average, in an increase in the cost of living (i.e., of the consumer price index, CPI) of around 6 percent, with this welfare impact being similar across income groups. About half or more of the increase in the cost of living was due to the indirect effect on the prices of other goods, emphasizing the importance of recognizing the large intermediate use of fuel products (especially diesel) by firms and the transport sector.

The issue of fuel subsidies in India has also been the subject of a number of papers. Anand M. K. (2012) presents a comprehensive assessment of the role of diesel in the Indian economy, noting that about a fifth of diesel sales are bulk sales, largely for transportation and power generation, and almost half of diesel sales are retail sales along the national highway network, much of which would also be for long-haul freight. The paper notes that the regulation of diesel prices began only during the oil price shocks of the 1970s. It also identifies and assesses various options for moving to a more market-based approach to fuel pricing and concludes that a gradual adjustment to international prices is preferable so as to reduce adjustment costs.

Lahoti, Suchitra and Goutam (2012) examines which groups benefit from LPG subsidies in India. Using data from the India Human Development Survey, it finds that, once various social and economic variables have been controlled for, urbanization and income are closely correlated with increased use of LPG. Therefore, the effect of liberalizing LPG prices would likely fall less on the poor than on those more able to afford higher prices for cooking fuel.

Bhanumurthy, Das and Bose (2012) assesses the macroeconomic impact of fuel price increases on the Indian economy using a detailed macroeconomic model that allows for monetary and fiscal policy responses to oil price shocks. It finds that allowing full pass-through of higher global oil prices to the Indian economy, as opposed to preventing pass

³ The 20 countries include 9 countries from Africa, 4 from Central and South America, 5 from Asia and the Pacific, and 2 from the Middle East.

through and raising the subsidy bill, has a negative effect on growth and adds to inflation in the short term. However, full pass-through reduces the current account deficit compared to no pass-through, as higher fuel prices reduce domestic oil demand and imports. In addition, when account is taken of alternative uses of public funds, raising fuel prices to full pass-through prices and reallocating some budgetary savings to public capital expenditures results in higher growth. Tapsoba (2012) comes to a similar conclusion using a DSGE model to estimate the consequences of various measures aimed at fiscal consolidation in India. It shows that a scenario under which untargeted transfers, such as universal fuel subsidies, are reduced and replaced with spending on either capital expenditure, or on a combination of capital expenditure and better-targeted subsidies, results in higher growth relative to a scenario that brings down the deficit by the same amount but does not reallocate public expenditure.

Parikh and others (2012) also examines the impact of the removal of the diesel subsidy on inflation and economic growth. It uses a VAR modeling approach to estimate a relationship between diesel prices and both the WPI and GDP, and then simulates the impact of increasing diesel prices on both these variables. The macro-economic impact of a 30 percent increase in diesel prices is compared to a “no-reform” baseline over 2011 to 2015. The analysis shows that although there is a short-term adverse impact of reforms on GDP and inflation, this is quickly reversed. After four years, inflation under the reform scenario was nearly 1.5 points lower and GDP was 0.7 percentage points higher. The reversal occurs sooner when money supply responds more quickly to the higher deficit under the no-reform scenario. The paper also finds that a 10 percent increase in diesel prices decreases real incomes on average by around 0.45 of a percent, which is regressively distributed across income deciles.

Recognizing the need to reform subsidies, the Indian government has appointed several committees to assess how best to address the issues raised by fuel subsidies:

- *Rangarajan Committee Report, 2006.* This report recommended that international (or “trade parity”) prices be used as a reference for a more market-based approach to pricing of petrol and diesel. It also recommended that subsidized kerosene should be restricted to below poverty line (BPL) families and the retail price of LPG be raised, with any remaining subsidies financed directly from the budget.
- *Parikh Committee Report, 2010.* This report recommended that the prices of petrol and diesel be fully liberalized, both at refinery gate and at the pump. It also recommended that: (i) subsidized kerosene sold through the public distribution system (PDS) be targeted to BPL families, and its price raised each year according to the growth in nominal agricultural GDP per capita; (ii) the price of kerosene sold outside of the PDS system be set close to that of diesel to eliminate incentives for diversion; and (iii)

subsidized LPG should be quantity rationed, or replaced by direct cash transfers to BPL households with LPG prices fully liberalized.

- *Nilekani Task Force Interim Report, 2011*. This task force was set up to work out modalities for the replacement of in-kind fuel and fertilizer subsidies by direct cash transfers to households using the Unique identification (UID) system currently being rolled out nationwide. The report argued that this would substantially reduce the fiscal cost of subsidies by eliminating the leakage that exists under the current system through beneficiaries receiving multiple benefits (duplication) or benefits for non-existent families or family members (ghost beneficiaries). The report also set out an action plan for implementing pilot reforms.
- *Kelkar Committee Report, 2012*. This report set out a “roadmap for fiscal consolidation”, including a timeline for the reduction of fuel subsidies. It recommended the elimination of diesel subsidies over a two-year period followed by full price deregulation in 2014. It also recommended the elimination of LPG subsidies over a period of three years, and the reduction of more politically sensitive kerosene subsidies by one-third over the same period.

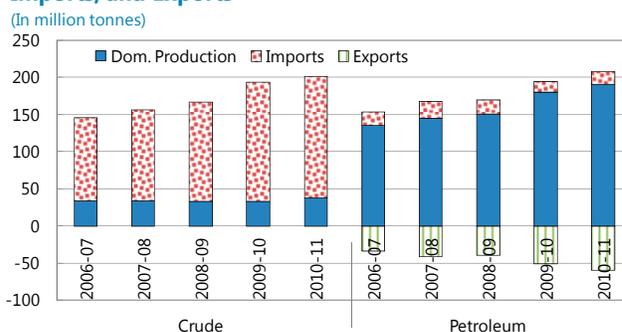
III. MAGNITUDE AND FINANCING OF FUEL SUBSIDIES IN INDIA

A. Structure of the Indian Petroleum Sector

India is the fourth largest global consumer of fuel products, and demand has been increasing due to high economic growth and rising incomes. Most of this increase has been met by increased domestic production of fuel products, but stagnant domestic crude production has required increased imports of crude oil by refineries (Figure 1). At the same time, reflecting increased refining capacity, exports of fuel products have also been increasing over recent years.

The government is heavily involved in the petroleum sector, both upstream and downstream, through state-owned enterprises. The upstream sector consists of all activities leading to the extraction of crude oil and natural gas. The downstream sector includes the refining of crude oil (domestic and imported) and the selling and distribution of natural gas and petroleum products. Reliance Industries Ltd (RIL) is the only private sector

Figure 1. Crude Oil and Petroleum Products: Production, Imports, and Exports



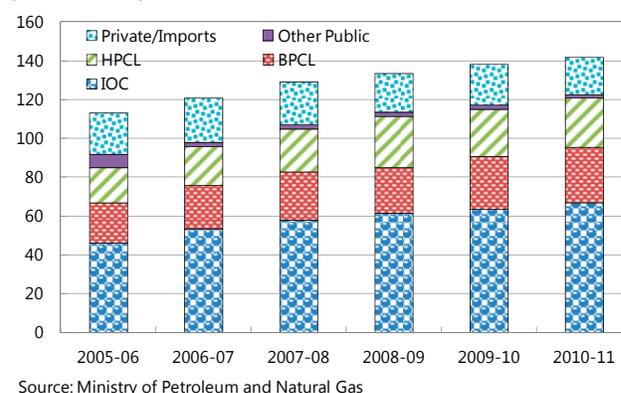
Source: Ministry of Petroleum and Natural Gas.

Note: Exports of petroleum products are shown as a negative number since they decrease supplies available for domestic consumption.

company present at all levels. Appendix Figure 1 provides an overview of the key players in the industry.

- *Crude Oil.* Two state-owned companies—Oil and Natural Gas Corporation Ltd (ONGC) and Oil India Ltd (OIL)—account for just over 75 percent of all extracted crude oil, with ONGC alone accounting for nearly 65 percent of extracted crude. The rest is accounted for by private companies and public-private joint ventures.
- *Refining.* The main public sector refining companies are Indian Oil Corp Ltd (IOC), Bharat Petroleum Corp Ltd. (BPCL), Hindustan Petroleum Corp Ltd (HPCL), and Chennai Petroleum Corp Ltd (CPCL). With most of the increase in refining capacity coming from the private sector since 2009, refining is now roughly equally divided between public and private refineries.
- *Distribution.* Prior to the mid-2000s, almost all downstream fuel product distribution was controlled by the three big state refining companies (IOC, BPCL and HPCL). To foster competition, in the mid-2000s the government authorized other upstream and refining companies⁴, both public and private, to distribute fuel products to domestic consumers in competition with public-sector distributors. However, IOC, BPCL, and HPCL still dominate the marketing side, controlling over 80 percent of the market, since it is not profitable for the private sector to distribute subsidized products (Figure 2).

Figure 2. Allocation of Domestic Fuel Product Distribution
(In million tonnes)

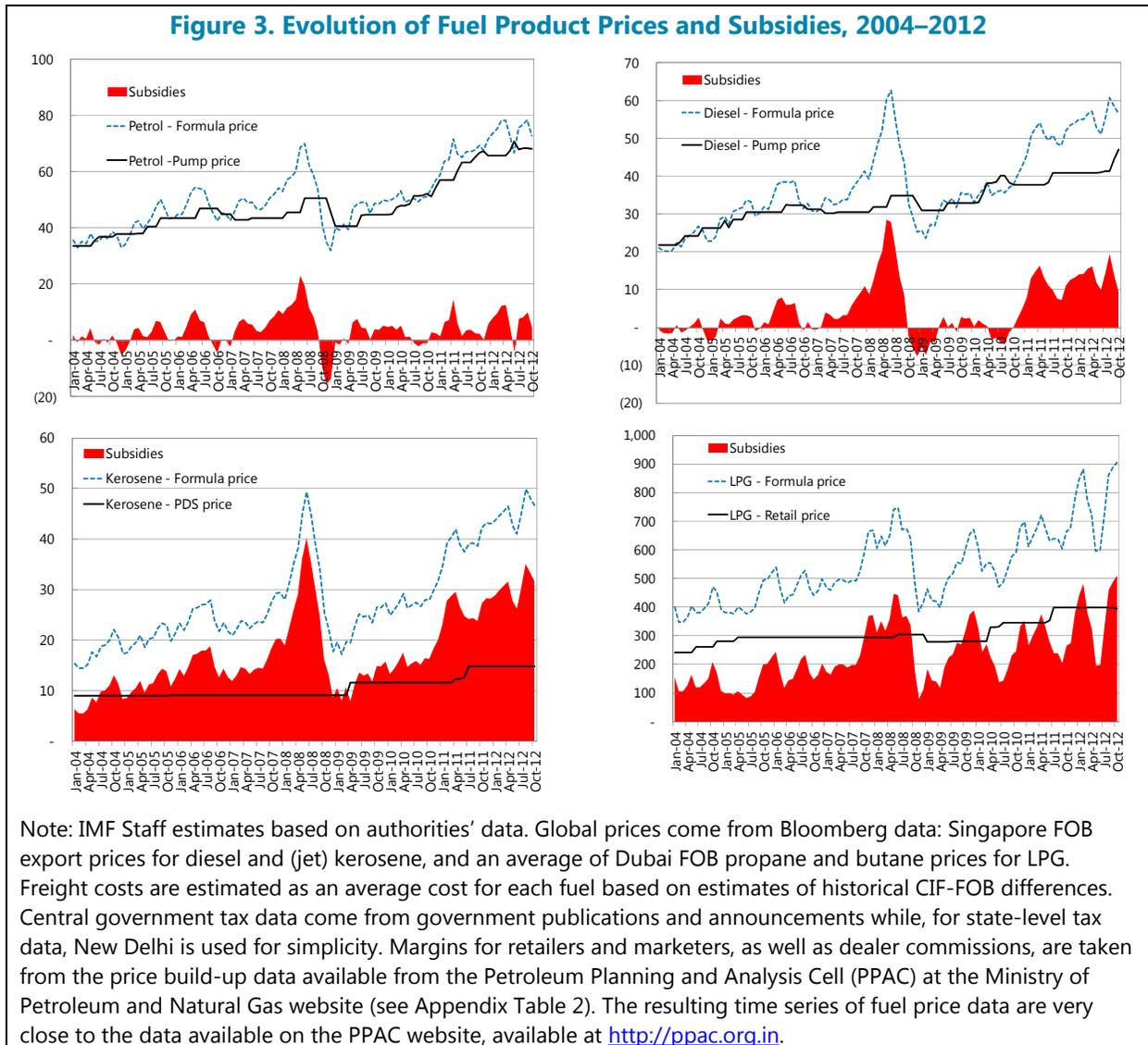


B. Under-pricing of Petroleum Products

In India, the retail prices of diesel, kerosene, and LPG are centrally administered. This policy has been driven by the desire to protect domestic consumers from rising international oil prices, and has resulted in large consumer price subsidies for some products. Although petrol prices have been liberalized, they are discussed in this section for comparison purposes.

⁴ Including: ONGC; GAIL; Mangalore Refinery and Petrochemicals Ltd (MRPL); Numaligarh Refinery Ltd (NRL); RIL; Essar Oil Limited (EOL); and Shell India Pvt. Ltd (SIMPL).

Figure 3 shows how fuel subsidy levels have varied across these fuel products over the last decade. Subsidy levels are calculated as the difference between international reference prices and regulated retail prices. International reference prices are calculated as the sum of international import prices (inclusive of international freight and insurance charges, as well as landing charges), product taxes (including customs tariffs, central government excises, and state sales taxes), and transport and marketing margins.⁵ Appendix Table 1 describes the detailed formula used by the government to calculate subsidies (in India generally referred to as “under-recoveries”).



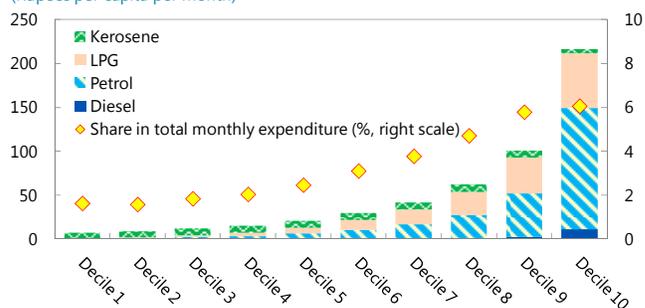
⁵ Subsidy calculations therefore include “tax subsidies” that arise when actual taxes are below target taxes. According to discussions with government officials, fuel product customs duties collected by refineries are not actually handed over to the revenue authorities, but are retained by the refineries and thus operate as would a standard protective infant industry tariff.

The degree of under-pricing differs across products as follows (Figure 3):

- *Petrol*. Domestic retail prices of petrol were liberalized in June 2010. Prior to this, domestic prices tended to move in line with international prices so that subsidies were generally small. The main exception was over 2007 and 2008 when domestic prices barely changed while international prices increased sharply, resulting in an escalation of petrol subsidies. However, subsidies fell sharply as international prices collapsed in the second half of 2008. Since then domestic prices have moved in line with international prices, although domestic suppliers seem to have smoothed recent price increases relative to international prices, and small subsidies still appear to exist.
- *Diesel*. Diesel retail prices continue to be regulated by the government. As with petrol, diesel subsidies increased sharply over 2007 and 2008 before collapsing along with the international price in the second half of 2008. Retail prices then moved upwards with international prices until the end of 2010, after which they diverged and diesel subsidies reemerged and increased. To address rising subsidies, regulated retail prices were increased by about Rs. 3.50 per liter in mid-September 2012. The resulting gap between petrol and diesel prices has led to increasing substitution of diesel for petrol automobiles. In January 2013, the government announced that all bulk diesel sales would take place at unsubsidized prices and that OMCs the discretion to periodically increase diesel prices by small amounts.
- *Kerosene and LPG*. Kerosene and LPG subsidies, per liter and per 14.2 kg cylinder respectively, have traditionally been much higher than for petrol and gasoline. Subsidies initially peaked with international prices in mid-2008 before falling sharply. Subsidies have increased continually over the last three years and have recently returned to their mid-2008 peak. At the end of 2012, the government restricted the amount of LPG that households could purchase at subsidized prices to 6 cylinders per year. However, in January 2013, the government announced that this quota would be increased to 9 cylinders.

Most of the benefit from price subsidies goes to higher income groups, which consume greater amounts of fuels. Both the per capita monthly expenditure on fuel products and the share of fuel expenditures in total expenditures are substantially higher for higher income households (Figure 4). Whereas the bottom two income deciles allocate around 1.6 percent of total expenditures to fuel consumption, the top two deciles allocate nearly 6 percent of total expenditures to fuel. Given the substantial

Figure 4. Composition of Household Fuel Expenditure by Income Group, 2009/10
(Rupees per capita per month)



Source: IMF Staff estimates based on the Indian 2009-10 Household Socio-Economic Survey.

overall inequality in household consumption, this translates into the highest income decile spending more than twenty times as much as the lowest decile on fuel in per capita terms. For the lowest income groups, almost all of their fuel expenditure reflects expenditure on kerosene, while for the highest income groups expenditures on petrol and LPG dominate.

C. Magnitude and Financing of Fuel Subsidies

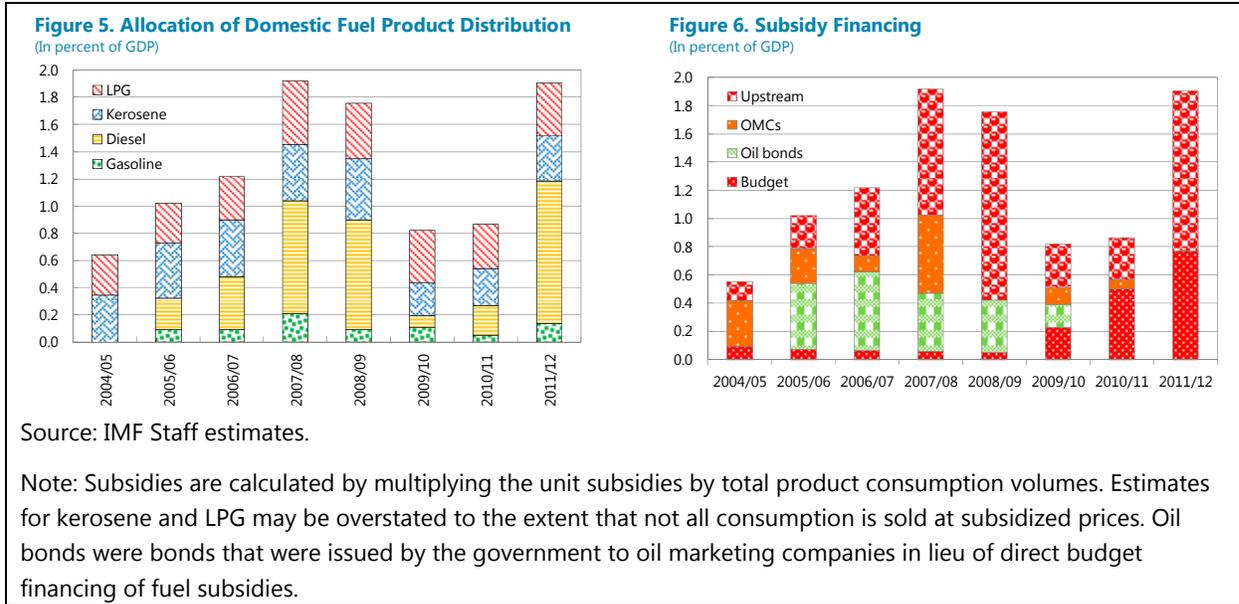
The magnitude of fuel subsidies has escalated during periods of increasing international fuel prices. Estimated fuel subsidies increased from 0.6 percent of GDP in 2004/5 to 1.9 percent in 2007/8 (Figure 5). Most of this increase was due to increasing diesel subsidies, which account for about 60 percent of the total volume of these four fuel products consumed in the country.⁶ Although subsidies decreased over the subsequent two years, they are again on the rise and reached 1.9 percent in 2011/2.

The government has financed subsidies through both budgetary and non-budgetary sources. In 2004/5, subsidies were financed almost exclusively off-budget, i.e., through oil marketing companies absorbing these losses as well as transfers from upstream oil companies to oil-marketing companies (Figure 6). The increase in subsidies over the following three years was financed mainly by the government issuing oil bonds to OMCs in lieu of direct transfers from the budget, and by increasing financing from upstream companies and OMCs. Upstream financing increased substantially in 2008/9.⁷ With the substantial decline in subsidies in 2009/10, upstream financing also decreased. No oil bonds have been issued since 2009/10. The subsequent sharp increase in subsidies over the next two years has been financed mainly from the budget and by upstream companies.⁸

⁶ Total fuel consumption is made of household final consumption (such as the use of kerosene and LPG for lighting and cooking) and enterprise intermediate consumption (such as the use of diesel for transporting goods).

⁷ With only public distribution companies receiving on-budget and off-budget support, private sector companies withdrew from oil marketing, thereby generating significant losses on their investment in retail outlets, but also reducing competition in marketing.

⁸ Note that the presence of off-budget financing means that the elimination of subsidies will be reflected in a corresponding improvement in the budget position only if the off-budget financing is redirected to the budget.



IV. PRICE AND WELFARE IMPACTS OF FUEL SUBSIDY REFORM

A. Methodology

The impact of increasing domestic fuel prices on the welfare of households arises through two channels (Arze del Granado, Coady, and Gillingham, 2012). First, there is a *direct impact* on households faced with higher prices for fuels consumed for cooking, heating, lighting, and personal transport. Second, there is an *indirect impact* through higher prices for other goods and services consumed by households as higher fuel costs are reflected in increased production costs and consumer prices. The magnitude of these impacts will therefore depend both on the importance of cooking, lighting, heating, and personal transport costs in total household consumption, and on the fuel intensity of other goods and services. The distribution of the impacts across different income groups will depend on the relative importance of these factors across income groups. For example, if the consumption baskets of higher-income groups are relatively more fuel intensive than those of lower-income groups, then the indirect impact will be greater for higher income groups.

Evaluating the *direct impact* requires data on household expenditures on fuels for cooking, heating, lighting, and personal transport. These data are available in the 2009/10 National Socio-Economic Household Survey and are used to calculate the “budget share” for each fuel product for each household, i.e., total household expenditure on each fuel product divided by total household consumption. The budget share for a given fuel provides an estimate of the welfare impact of a doubling of the fuel price absent any demand response. For example, if the budget share for certain fuel is 0.05 (i.e., the household allocates 5 percent of its total consumption budget to this fuel) then a doubling of this fuel’s price will result in a decrease in welfare for the household equivalent to a 5 percent decrease in real income.

The direct impact of a specific increase in the price of a fuel product can thus be calculated as:

$$\text{Direct Impact} = \text{Budget Share} \times \text{Percentage Increase in Fuel Price} \times 100$$

Since this estimate of the direct welfare impact implicitly assumes that households do not reduce the impact by substituting away from fuel, it is often interpreted as either an estimate of the short-run impact (i.e., before households can adjust fuel consumption) or as an upper-bound of the long-run estimate.

Estimating the *indirect impact* of fuel price increases requires an estimate of the impact of higher fuel prices on the prices of other goods and services, which essentially requires a model of price shifting. The model used in this paper is taken from Coady and Newhouse (2006), which is described in more detail in Appendix 2. This model assumes that increases in fuel production costs are fully passed forward onto the domestic prices of goods and services. Estimating these price increases requires information on the production structure of the economy, e.g., an input-output table describing the share of different inputs in the production cost structure. But the implicit assumption of zero demand price elasticity means that these estimates should again be interpreted as short-term impacts or upper-bounds on long-term impacts. Once the impact of higher domestic fuel prices on the prices of other goods and services is estimated, these estimates are multiplied by the household budget shares for each of these consumption categories (taken from a household survey) to get the welfare impact of each price change.

The distribution of the welfare impact across households in different parts of the income distribution is estimated by calculating the average impact for households in different income groups. Consistent with most studies of poverty and inequality, households are allocated to welfare quintiles based on a measure of consumption per capita. The distribution of the welfare impact from a price increase is classified as progressive if the percentage welfare (i.e., real income) loss increases with the level of total per capita household consumption. Therefore, a progressive (regressive) distribution of the welfare loss means that the share of higher income groups in the aggregate welfare loss is greater (less) than their share in aggregate consumption.

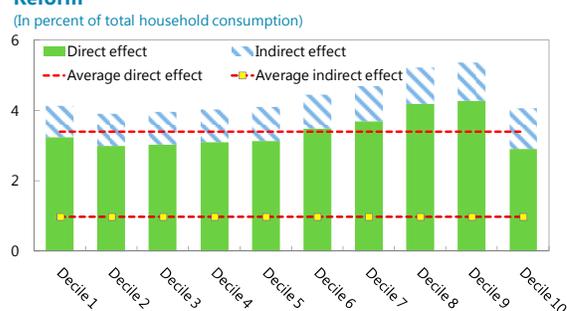
B. Welfare Impact of Subsidy Reform

The results discussed below are based on the estimated under-pricing of fuels prevailing at end-October 2012 (Table 1). Eliminating subsidies would entail significant increases in retail prices, particularly for kerosene and LPG. The calculation of the direct impacts of these simulated price increases uses expenditure data from the 2009/10 National Socio-Economic Household Survey. The indirect price impacts are estimated using an input-output table for India for 2003/04, the most recent available, which is disaggregated into 130 sectors. The simulations assume that the indirect impact arises only from the increase in the diesel price.

Table 1. Under-pricing of Fuel Products, November 2012

	(In rupees per liter)			
	Import Parity Price	Regulated Price	Difference	Percent of Regulated Price
Kerosene	46.9	14.8	32.1	217.4
LPG	911.5	410.5	501.0	122.1
Diesel	57.0	47.2	9.8	20.9
Gasoline	72.7	68.1	4.7	6.8

Source: IMF staff estimates

Figure 7. Distribution of Welfare Impact of Fuel Subsidy Reform

The total welfare impact is calculated as the sum of the direct and indirect impacts. The distribution of these welfare impacts across income groups is presented in Figure 7. On average, eliminating fuel subsidies would decrease household real incomes (or, equivalently, increase the CPI) by around 4 percent. About three-quarters of this total impact comes from the direct impact on the price of fuels consumed by households for cooking, lighting, and personal transport, reflecting the relatively large increases in the prices of kerosene and LPG.⁹ Although the indirect impact is similar across income groups, the composition of this impact differs. Whereas higher food prices dominate the indirect impact for lower income groups, higher non-food prices dominate for higher income groups (Appendix Figure 2). The total impact is progressive in that the magnitude of the impact is higher for higher income groups—the somewhat lower impact for the top income decile reflects the relative importance of petrol consumption for this group and the small increase in petrol prices. The progressivity of the total impact reflects the large price increase for LPG and its relative importance for higher income groups.

C. Compensation and Net Fiscal Savings

Although the percentage welfare impact of subsidy reform is similar across income groups, the absolute per capita impact differs substantially reflecting the highly unequal distribution of total consumption (Figure 8). For example, the average per capita welfare impact for the bottom two income deciles is about Rs 20 per capita per month compared to an average impact of around Rs 120 per capita per month for the top two deciles.

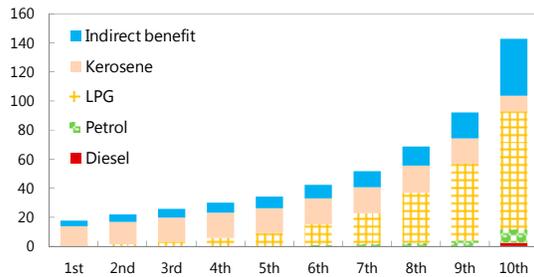
Since lower income groups receive a very small proportion of total fuel subsidies, it should therefore be possible to both fully protect these lower income groups from the adverse impact of fuel subsidy reform while simultaneously generating substantial net fiscal savings. For

⁹ The dominance of the direct impact arising from higher price increases for kerosene and LPG also means that the impact on the WPI is much lower, at 2.2 percent, compared to the impact on the CPI.

example, the cost of fully compensating the poorest 40 percent of households¹⁰ is less than 0.2 of a percent of GDP (Figure 9). This compares with a gross fiscal savings from subsidy reform of 1.9 percent of GDP, so that the net fiscal gains from such a reform scenario would equal 1.7 percent of GDP. Of course, this calculation implicitly assumes that compensating transfers can be perfectly targeted without any leakage of benefits to higher income groups. However, it does highlight the substantial fiscal gains that can be reaped from developing a well-targeted social safety net system.

Figure 8. Welfare Loss from Subsidy Reform by Income Group

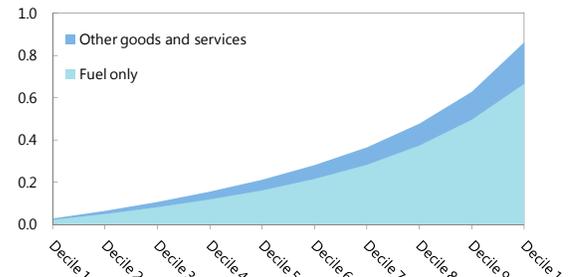
(In Rupees per capita per month)



Source: IMF Staff estimates based on the Indian 2009/10 Household Socio-Economic Survey.

Figure 9. Cumulative Fiscal Cost of Compensating Households for Subsidy Reform

(In percent of GDP)



Source: IMF Staff estimates based on the Indian 2009/10 Household Socio-Economic Survey.

V. REFORMING FUEL SUBSIDIES IN INDIA

A. International Experience with Fuel Subsidy Reform

Reform experiences in other countries provide insights into key design ingredients that can enhance the likelihood of successful and durable subsidy reform (IMF, 2013). These include:

- *Communications campaign.* Reform should be preceded by a public information campaign highlighting the motivation for reform. This campaign should highlight that fuel subsidies are fiscally costly, that the benefits are regressive and accrue mostly to higher income groups, and that subsidies crowd-out higher priority public spending (e.g., on education, health, social protection, and public infrastructure).
- *Comprehensive reform plan.* A clear reform plan should be developed and communicated to the public. This should identify a vision for creating a more efficient petroleum product sector, a clear timeline for eliminating subsidies, and key public expenditures that will be financed by the resulting fiscal space. The total cost of fuel subsidies should be transparently recorded on-budget. The reform plan should also specify measures to

¹⁰ Around 30 percent of households are estimated to have consumption levels below the national poverty line.

mitigate the adverse impact of price increases on consumers, in particular lower-income households.

- *Gradual and sequenced reform.* Where subsidy reform involves large increases in fuel prices, these should be implemented gradually to allow consumers time to improve their energy efficiency and thus mitigate the adverse impact of future rounds of price increases. Gradual reform also helps to reduce the impact on inflation. The reform can be sequenced by concentrating initial price increases on fuel products that are less important for lower income households (e.g., petrol) and more gradually increasing the prices of fuels that are more important for lower income households (e.g., kerosene). This also allows time to strengthen the social safety net to protect households from price increases, including through better targeting of fuel subsidies. Gradual reform can be achieved through the adoption of an automatic pricing mechanism that increases retail prices according to pre-determined rules and smoothes adjustment by limiting the magnitude of price adjustments.

A number of successful country reforms have contained the above ingredients, including undertaking fuel subsidy reform as part of more extensive reforms of their energy sectors (IMF, 2013):

- *Brazil.* Brazil adopted a gradual approach to eliminating fuel subsidies so as to minimize the resistance of opposition groups that benefit from subsidies and to ensure that the process would be politically acceptable. Reforms started by sequentially deregulating the pricing of key fuel products in the mid-1990s. Petrol pricing was deregulated in 1996, LPG in 1998, and diesel in 2001. After the withdrawal of LPG subsidies in 2001, the government introduced a new targeted LPG subsidy that gave LPG vouchers to low-income households. It also introduced a large nationwide targeted cash transfer program in 2001 to protect households from general price shocks. In 2003, the LPG subsidy programs and this targeted cash transfer program were consolidated under a new national flagship conditional cash transfer program, the *Bolsa Familia*.
- *The Philippines.* The Philippines initiated energy price liberalization as part of broader energy sector deregulation from 1996. The success of the reforms has been attributed to strong political will, good advance planning, and effective consensus building. Prior to implementing reforms, the government undertook a nationwide road-show highlighting the benefits of reform. Implementation of reforms in an environment of strong economic growth and low inflation also helped to reduce resistance to price reforms. The government started by adopting an automatic pricing mechanism that reduced subsidies gradually through monthly price increases. In July 1998, fuel pricing was completely liberalized. During the sharp increase in international fuel prices over 2007 and 2008, as part of a package of targeted expenditure measures, the government launched a new cash transfer program, which was gradually scaled-up.

- *Turkey.* Turkey initiated an energy sector deregulation and price liberalization program in the early 1990s. An automatic fuel pricing mechanism was adopted in 1998, with responsibility for its implementation transferred to the independent Energy Market Regulatory Authority in 2003. Since then, fuel taxes have gradually been increased. The success of the reforms has been attributed to the broad public support generated by the government for economy-wide structural reforms as well as the strong macro-economy with high growth and low inflation. Expenditures on existing targeted social safety net programs were also scaled-up, including a targeted cash transfer program.

B. Fuel Subsidy Reform in India

Fuel subsidy reform has been part of the Indian government's policy agenda over the last decade, and various committees have been appointed to examine the approach to fuel pricing and to identify key reform challenges and solutions. However, despite the government's emphasis on fuel subsidy reform, a comprehensive plan to reform subsidies has not been officially adopted. This section outlines a possible reform agenda for the remaining fuel subsidies for diesel, LPG and kerosene.¹¹

The approach to subsidy reform should vary across fuel products reflecting differences in their fiscal cost, in the magnitude of the price increases needed to remove subsidies, and in the importance of subsidies for the poor. Whereas diesel subsidy reform could proceed immediately, without the need for extensive consultation and communication, this is not the case for LPG and kerosene.

Diesel Subsidy Reform

Priority should be given to removing the remaining diesel subsidies. To completely remove existing subsidies, regulated diesel prices would need to be increased by Rs. 10 per liter, from Rs. 47 to Rs. 57, i.e., a 20 percent increase. If, in line with recent government announcements, oil marketing companies were to increase prices by Rs. 0.5 per month, the diesel subsidy could be completely removed by mid-2014. The elimination of diesel subsidies will also help address the large existing distortion in relative petrol and diesel prices—petrol prices are currently around 45 percent higher than diesel prices—which has resulted in a substantial substitution of diesel for petrol automobiles and further exacerbated the fiscal cost of diesel subsidies. Although such a gradual reform process will reduce the impact on annual inflation and household real incomes, it prolongs the risk of reform reversal due to political and social resistance. In addition, the timeline for eliminating subsidies will

¹¹ For a more detailed discussion of the current workings of the fuel subsidy system and on-going reform efforts, see TERI (2012).

be longer, and the associated budget savings smaller, to the extent that international diesel prices increase over this period

The full liberalization of pricing presents its own challenges that need to be anticipated. Full liberalization means that sharp increases in international prices are passed through to domestic consumers with a short time lag. In practice, this could result in large one-off increases in prices, which may generate substantial public resistance and possibly undermine liberalization. While this may be less of a concern for petrol, which is consumed mostly by the highest income groups, it may be more of a concern for diesel given that all income groups are affected through increases in the prices of other goods and services. One option could be to adopt an automatic fuel pricing mechanism that smoothes the adjustment by limiting the magnitude of any single price change (say per week or per month) but still ensures full pass-through over the medium term (Coady and others, 2012). However, while smoothing reduces domestic price volatility, it comes at the cost of greater fiscal volatility. Avoiding the return of subsidies also requires smoothing when international prices decrease by not fully passing these decreases through to consumers. Such a mechanism could be adopted immediately as part a gradual subsidy reform plan and it would also automatically factor in any international price increases that occur over the next year into the duration of subsidy reform.

LPG Subsidy Reform

To contain the cost of LPG subsidies, from September 2012 the government imposed an annual quantity limit of six 14.2 kg cylinders of subsidized LPG for each household (or “connection”), with consumption above this level available at unsubsidized prices. However, in January 2013, this limit was increased to 9 cylinders, which is likely to offset most of the savings from the earlier reform.¹²

The current subsidy on LPG is around Rs. 500 per cylinder and eliminating this would require a 217 percent increase in price from the current price of Rs. 410 per cylinder. The imposition of a quantity-rationed system means that the removal of the subsidy on consumption above this level will not have a large impact on lower income households since these tend to consume lower quantities of LPG. The existing subsidy could be eliminated over a two-year period, somewhat faster than the three-year period recommended by the Kelkar report. The adoption of an automatic LPG pricing mechanism with a smoothing component could also ensure that prices adjust gradually and that future changes in international prices are automatically factored into the price adjustment process.

¹² According to Parikh (2010, Table L1), in rural areas annual consumption of LPG ranged from 5 cylinders per year for the lowest income decile to 8 cylinders for the richest decile. The equivalent range in urban areas was 8 to 10 cylinders per year.

Once the price for LPG purchased on the market (i.e., consumption of quantities beyond the subsidized quantity limit) has reached unsubsidized levels, the government should consider transforming this universal rationing system into a better targeted system focusing on lower income households, and also to eventually transforming this in-kind subsidy into a cash transfer. Such an approach was recommended by both the 2010 Parikh Report and the 2011 Nilekani Report. This would generate additional fiscal savings while simultaneously protecting, or even benefitting, low-income households. The issues of targeting and cash transfers are discussed further below.

Kerosene

Although the international price of kerosene has increased by around 150 percent since early 2009, the price of subsidized PDS kerosene has hardly changed. As a result, the per liter subsidy on kerosene has increased almost threefold, from around Rs. 10 in early 2009 to Rs. 30 in October 2012. Removing the subsidy thus requires nearly a 220 percent increase in the price of kerosene.

Kerosene subsidies could be reduced through two channels. First, the adoption of a more effective beneficiary registration and monitoring system would help to reduce illegal leakage due to duplicate and ghost ration cards.¹³ In this regard, the ongoing nationwide rollout of India's Unique Identification (UID) system, which will result in the biometric identification of all Indians over the next three years, is extremely promising.¹⁴ Second, the fact that higher income households need to turn up in person to receive subsidized kerosene could lead to many of them self-selecting out of the program. Third, as recommended by both the 2006 Rangarajan Report and the 2010 Parikh Report, the kerosene subsidy could be limited to so-called "BPL households", i.e., by removing the subsidy entitlement from "above poverty line" (APL) households. Unsubsidized kerosene prices could be determined by an automatic kerosene pricing mechanism with a smoothing component to avoid large one-off increases in domestic prices when international kerosene prices increase sharply. Consideration should also be given to the eventual replacement of in-kind kerosene subsidies with cash transfers.

¹³ For example, it has been estimated that 38 percent of PDS kerosene does not reach its intended beneficiaries (Rangarajan and others, 2006; Business Standard, 2005).

¹⁴ This system is conventionally referred to in India as *Aadhaar*. Using very conservative estimates of benefits, a recent report by the National Institute of Public Finance and Policy has estimated that the real internal rate of return to the adoption of *Aadhaar* as a registration system for a number of social programs is around 53 percent.

Cash Transfers

The issue of transforming in-kind fuel subsidies into cash transfers is being actively debated in India. The 2010 Parikh Report suggested that current kerosene subsidies could be replaced by cash transfers targeted at poor households. Such a switch was also recommended by the 2011 Nilekani Report.

The level of cash transfers should be determined as the unit subsidies on kerosene and LPG times their existing rationed quantities. This transfer level could be inflation-indexed to protect households from future international price shocks. Replacing kerosene and LPG subsidies with cash transfers would also avoid the need for the government to be involved in the distribution of fuel. Under such a reform, households simply receive cash and decide where and how to spend this money, with all fuel being sold at non-subsidized prices. Eventually there would be no need for a distinction between government and private sector outlets, although the government would need to ensure that all consumers have access to adequate fuel supplies.

Further savings could be generated if transfers were better targeted at lower-income groups. This would involve eliminating non-poor households that currently receive kerosene and LPG subsidies from the receipt of cash transfers. It would also require the development of a more effective approach to targeting than that currently used for identifying BPL and APL households for which both undercoverage of poor households and unintended leakage to non-poor households are thought to be quite large (Jha and Ramaswami, 2011; World Bank, 2011; Lang and Wooders, 2012; TERI, 2012). The magnitude of savings would depend on where the poverty line was drawn for the purpose of targeting transfers. Savings would also be lower to the extent that some genuinely poor households are currently deemed ineligible for fuel subsidies. Including such households in any compensation program is necessary to avoid increasing poverty as a result of rising fuel prices.

Experience of implementing large-scale targeted cash transfer programs in developing countries has shown that effectively designed, implemented and evaluated pilot schemes can provide valuable information on the attractiveness of such programs to beneficiaries, help refine program design before scaling up, and even help build-up political support for their expansion (Fiszbein and Schady, 2009). However, while pilot subsidy reform programs have apparently been implemented in some districts in India, information was not available on their design or performance. Learning lessons from such pilots will be crucial to the successful scaling-up of such programs nationwide.

VI. CONCLUSIONS

The current approach to fuel pricing in India has resulted in large fuel subsidies. These subsidies increased sharply from around 0.8 percent of GDP in 2009/10 to 1.9 percent of

GDP in 2011/12. As well as being fiscally costly, these subsidies are both inefficient and inequitable. However, eliminating them will have a substantial negative impact on the real incomes of households, estimated to range from 4 percent for the lowest income groups to 5 percent for higher income groups. About three-quarters of the impact arises from substantially higher prices for kerosene and LPG.

Although the government has expressed its commitment to controlling fuel subsidies and recently undertaken measures to lower these subsidies, it has not as yet set out a medium-term reform agenda for subsidy reform, including measures to ensure large subsidies do not recur. However, a number of commissions have recommended options for subsidy reform. These commissions have recommended: (i) the use of international fuel prices as the appropriate reference for setting prices; (ii) the elimination of diesel subsidies over the short-term followed by full diesel price liberalization; (iii) the gradual removal of kerosene and LPG subsidies; and (iv) the replacement of in-kind subsidies with targeted cash transfers.

International experience with subsidy reforms suggests that these are more likely to be successful if they are part of a more comprehensive reform strategy aimed at improving the overall efficiency of the petroleum product sector. The benefits and details of such a reform strategy should be clearly communicated to generate political support from key stakeholders, including the public. Where existing subsidies are large, a gradual reform strategy can reduce the adverse macroeconomic impacts of higher fuel prices, allow consumers time to adjust consumption levels through improvements in energy efficiency, and allow time to strengthen the social safety net to better target subsidies and protect the poor from future price increases.

In India, since it accounts for the largest share of the total fuel subsidy, priority should be given to eliminating diesel subsidies over the short term. If the oil marketing companies increase diesel prices by the Rs. 0.5 per month recently allowed by the government then the subsidy could be eliminated by the end of 2014. This should be, followed by full price liberalization, as recommended by the Parikh and Kelkar reports. The relatively small price increases required means that this could probably be implemented without generating much public resistance. However, full liberalization of pricing presents its own challenges since fully passing through any future sharp increases in international prices may generate substantial public resistance and possibly undermine liberalization. This could be avoided by adopting an automatic fuel pricing mechanism that smoothes the adjustment to higher prices by limiting the magnitude of any single price changes but still ensures full pass-through over the medium term. Such a mechanism could be adopted immediately as part a gradual subsidy reform plan and it would also automatically factor in any international price increases that occur over the next year into the duration of subsidy reform.

The large price increases required to eliminate LPG and kerosene price subsidies means that, compared to diesel subsidy reform, a more gradual and comprehensive reform strategy is advisable. The recent imposition of quantity rations for subsidized LPG means that gradual

subsidy reform can begin in the short-term since low-income households will be fully protected. As with diesel, this could be achieved through the adoption of an automatic pricing mechanism incorporating smooth adjustment of prices. Once the price for LPG purchased on the market has reached unsubsidized levels, the government could consider transforming this universal rationing system into a better targeted safety net system focusing on lower income households, and eventually transforming this in-kind subsidy into a cash transfer.

A gradual subsidy reform is also desirable for kerosene subsidies given the magnitude of the existing subsidy and its relatively greater importance in the budgets of the poor. The first phase of reform should focus on developing a more effective beneficiary registration and monitoring system to reduce illegal leakage due to duplicate and ghost ration cards. In this regard, the ongoing nationwide rollout of India's UID system is extremely promising. Once this has been achieved, further savings could be generated through better targeting, such as withdrawing subsidy entitlements from APL households. Unsubsidized kerosene prices could be determined by an automatic kerosene pricing mechanism with a smoothing component to avoid large one-off increases in domestic prices when international kerosene prices increase sharply. Consideration should also be given to the eventual replacement of in-kind kerosene subsidies with cash transfers.

Developing a system to better target subsidies will be key to reducing subsidies over the medium term. While the UID system should help eliminate duplicate and ghost beneficiaries, it is not a substitute for an effective targeting system. The current approach used to identifying BPL and APL households needs to be reformed since it results in substantial undercoverage of poor households and unintended leakage to non-poor households (World Bank, 2011; TERI, 2012). Improving targeting will therefore involve both withdrawing entitlements from non-poor households that currently receive subsidies as well as including genuinely poor households that are currently excluded. Experience of implementing targeted transfer programs in developing countries has also shown that effectively designed, implemented and evaluated pilot schemes can provide valuable information for improving the design and implementation of such programs.

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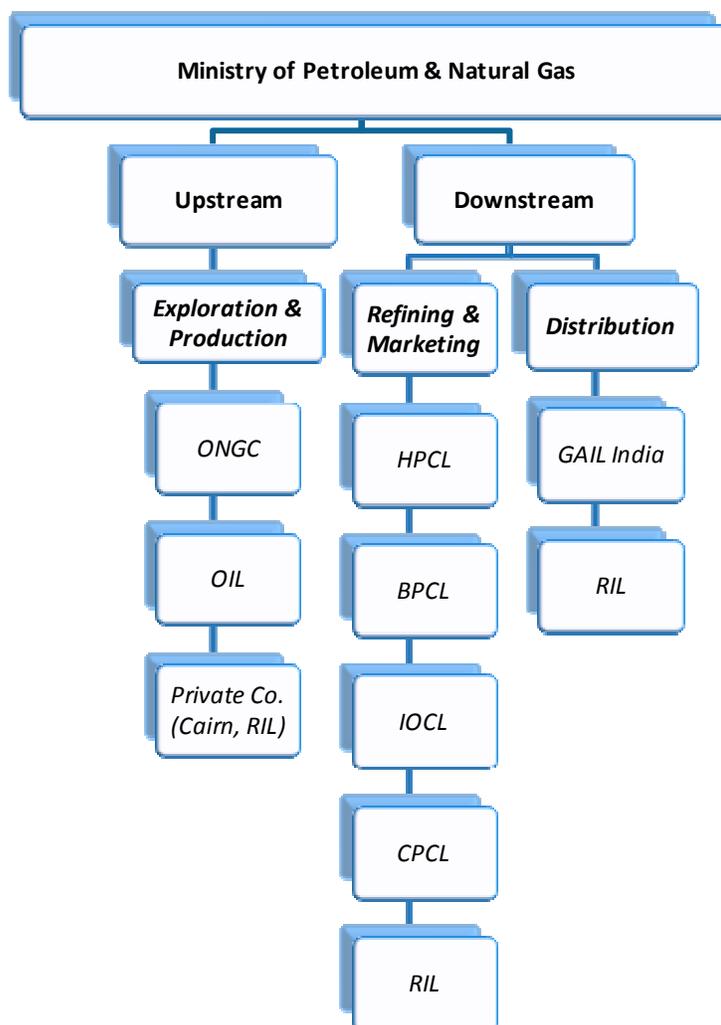
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Appendix Figure 1: Key Players in India Oil Industry



Source: Ministry of Petroleum & Natural Gas

Appendix Table 1. Price Structure of Petroleum Products as of November 1, 2012

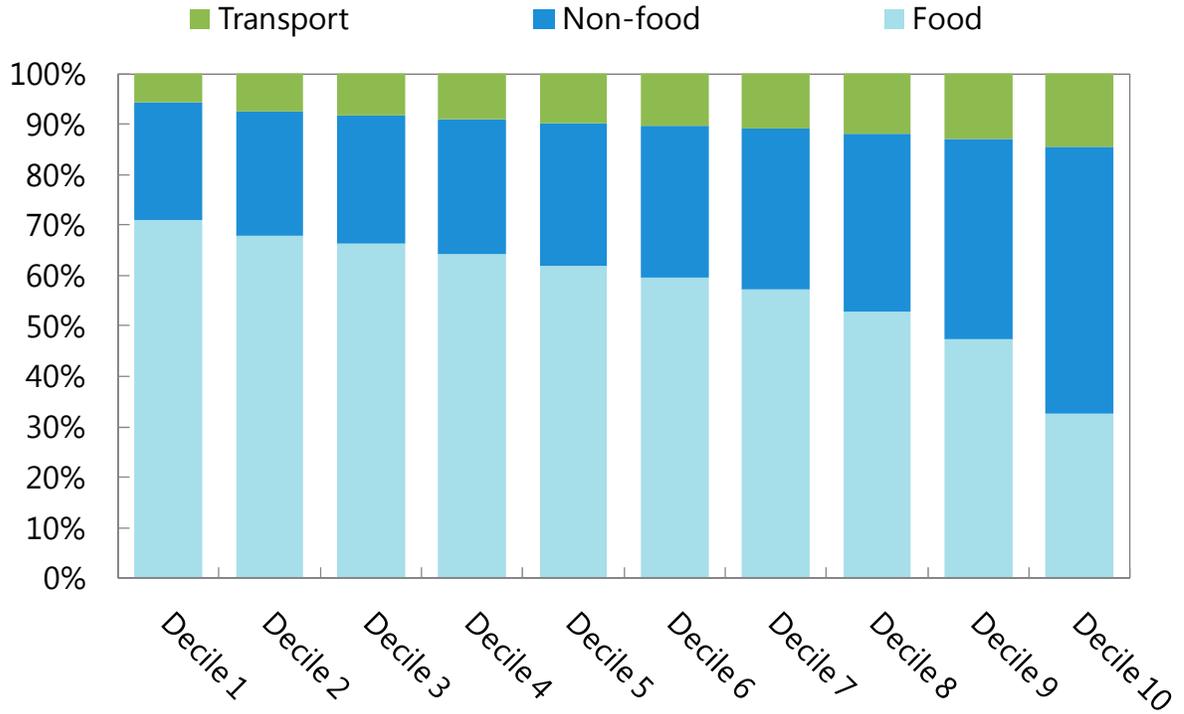
	<i>Rs/liter-cylinder</i>		
	<u>Diesel</u>	<u>PDS Kerosene</u>	<u>LPG (14.2 kg)</u>
C&F price	43.46	43.27	771.82
Import charges (Insurance, port, ...)	0.4	0.29	6.31
Customs duty	1.13	-	-
Import parity price	44.99	-	-
Export parity price	42.9	-	-
Trade parity price ^{1/}	44.57	43.56	778.12
Premium recovered	0.04		
Inland freight and delivery	0.85	0.76	38.31
Marketing cost of OMCs	0.67	0.41	12.58
Marketing margin of OMCs	0.72	0.33	6.74
Bottling charges	-	-	38.68
Total desired price	46.85	45.06	874.44
Under-recovery of OMCs	9.84	31.3	478.45
Subsidies	-	0.82	22.58
Price charged to dealers	37.01	12.96	373.41
Excise duty	3.56	-	-
Dealer commission	1.09	1.13	37.25
VAT ^{2/}	5.49	0.7	-
Retail selling price	47.15	14.79	410.5
Memo:			
<i>Total taxes</i>	<i>10.18</i>	<i>0.70</i>	<i>-</i>
<i>Total margins</i>	<i>3.37</i>	<i>2.63</i>	<i>133.56</i>
<i>Required price increase (Rs)</i>	<i>9.84</i>	<i>32.12</i>	<i>501.03</i>
<i>Price increase (%)</i>	<i>20.9</i>	<i>217.4</i>	<i>122.1</i>

^{1/} The trade parity price for diesel is an average of import (80%) and export prices (20%).

^{2/} The VAT rate is 12.5 percent for diesel.

Source: Indian authorities.

Appendix Figure 2. Composition of Indirect Welfare Impact
(Percent share of total indirect impact)



Source: IMF Staff estimates based on the Indian 2009/10 Household Socio-Economic.

APPENDIX A. DESCRIPTION OF DATA

Household Survey Data

The National Sample Survey (NSS), set up by the Government of India in 1950 to collect socio-economic data, conducted its sixty-sixth round (the eighth quinquennial survey) over July 2009-June 2010, collecting data on household consumer expenditures, as well as employment and unemployment data. The consumer expenditure survey is used to generate estimates of average household monthly per capita expenditure (MPCE, obtained by dividing household expenditure by household size), its distribution over households and individuals, and breakdown over different commodities. Barring a few remote villages in two states, the survey covers the whole Indian union, spanning nearly 13,000 rural and urban sampling units, and more than 100,000 households. The MPCE estimates are considered to be reasonably robust at the national and urban and rural levels, and for large states. These estimates inform apex level planning and resource allocation, are a key input in the construction of the consumer price index, are used to assess living standards, poverty levels, and inequality and inclusiveness of growth.

Input-output Data

The Central Statistical Office (CSO) compiles the Input Output Transactions Tables (IOTT) for the Indian economy at regular intervals; tables have been published for the years 1973–74, 1978–79, 1983–84, 1989–90, 1993–94, 1998–99, 2003–04, and 2006–07. The 2003–04 tables have been published at the 130-sector classification. The IOTT record flows of commodities at factor cost from one sector to another, from which a number of technical tables are derived. The sources of data for constructing the IOTT are taken from those used to construct the National Accounts Statistics for the primary and tertiary sectors. For manufacturing in the formal sector, Annual Survey of Industries (ASI) data is used, whereas for the informal sector, a survey on unorganized manufacturing conducted by NSSO in 2000–01 is used as a basis to assess inputs and outputs. The gross value added and output of these sectors is consistent with the NAS where feasible.

From the suite of 7 matrices published in 2003–04, this paper uses the “absorption matrix”, which shows the value of a given commodity input (in rows) required to produce the value of gross output of the industry. This matrix is transformed into the Leontief coefficient matrix by dividing the different input costs for each industry (or column) by the total value of gross output of that industry to derive the share of that input’s cost in gross output. This coefficient matrix is used in the paper to estimate the impact of fuel subsidy reform on the prices of goods and services in the economy.

APPENDIX B. METHODOLOGY FOR ESTIMATING INDIRECT PRICE EFFECTS

Typically, the bulk of total fuel products is not consumed directly by households, but indirectly through their consumption of other goods and services that use fuel products as inputs. Therefore, the welfare effect of higher fuel prices on household real incomes will depend both on the *direct effect* of higher prices for fuel products and on the *indirect effect* arising from higher prices for other goods and services to the extent that higher fuel costs are passed on to consumer prices.

This appendix details the methodology used to estimate the indirect impact of higher fuel prices on the prices of other goods and services consumed by households. Modeling the indirect effect requires a model of price shifting behavior to identify how higher fuel costs are shifted on to prices in other sectors of the economy. The model used is that developed in Coady and Newhouse (2006).

We start by grouping commodities into two broad classifications reflecting the assumed relationships between higher production costs and output prices:

- (i) *Cost-Push Sectors*: These are sectors where higher input costs are passed on fully to output prices. We can therefore (loosely) think of these as non-traded commodities.
- (ii) *Controlled Sectors*: These are sectors where output prices are controlled by the government. Therefore, the relationship between output prices and production costs depends on if and how the government adjusts controlled prices. If controlled prices are not adjusted then the burden of higher costs will be borne by factor prices, profits, or government revenue.

When modeling *price changes* it is useful to think of “aggregate” commodity categories (e.g., the aggregate categories available from an input-output table) as made up of a certain proportion of cost-push and controlled commodities, with these proportions given by α and β , respectively. These proportions should obviously sum to unity and never be negative, i.e., $0 \leq (\alpha, \beta) \leq 1$ and $\alpha + \beta = 1$. The technology of domestic firms is captured by a standard input-output coefficient matrix, A , with typical a_{ij} element denoting the cost of input i in producing one unit of output j – think of units of output defined such that they have a user price of unity so that price changes below can be interpreted as percentage changes. Consistent with the interpretation of A as capturing an underlying Leontief (i.e., fixed coefficient) production technology, we can interpret a_{ij} ’s as the change in the cost of producing a unit of j due to a unit change in the price of input i .

For *controlled* sectors, producer prices are determined by pricing controls (say, \tilde{p}) and assumed equal to user (or consumer) prices \tilde{q} so that:

$$\tilde{q} = \tilde{p} \quad (1)$$

The formula for price changes is then given simply as:

$$\Delta\tilde{q} = \Delta\tilde{p} \quad (2)$$

where the r.h.s. is specified exogenously in the reform package.

For *cost-push* sectors, the relationship between user (consumer) and producer prices is given by:

$$q^c = p^c + t^c \quad (3)$$

where q^c is the price paid by users of a commodity and p^c the price received by producers, the difference between these being any sales or excise taxes, t^c , imposed by the government. Producer prices are, in turn, determined as follows:

$$p^c = p^c(q, w) \quad (4)$$

where q are the user costs of intermediate inputs and w are factor prices. For these sectors, cost increases are assumed to be fully pushed forward onto user prices so that factor payments are fixed. From (3), assuming taxes do not change, one gets:

$$\Delta q^c = \Delta p^c \quad (5)$$

Using (4), the input-output coefficient matrix and assuming factor prices are fixed, the change in producer prices is derived as:

$$\Delta p^c = \Delta q^c . \alpha . A + \Delta \tilde{p} . \beta . A \quad (6)$$

where Δ signifies a price change, all price changes are interpreted as $n \times 1$ row vectors where n is the number of commodity groups, (α, β) are now $n \times n$ diagonal matrices, and A is a $n \times n$ input-output coefficient matrix. Substituting in from (5) one gets:

$$\Delta p^c = \Delta p^c . \alpha . A + \Delta \tilde{p} . \beta . A$$

so that:

$$\Delta p^c = \Delta \tilde{p} . \beta . A . V \quad (7)$$

where $V=(I-\alpha.A)^{-1}$ with I being a $n \times n$ identity matrix. The typical element of the inverse matrix V , v_{ij} , captures the combined direct and indirect use of cost-push sector i used to produce one unit of cost-push sector j . The change in sector aggregate prices is then given by:

$$\Delta q = \alpha.\Delta q^c + \beta.\Delta \tilde{q} \quad (8)$$