Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.5, No.3, 2014

Petroleum Subsidies and Macroeconomic Variables in India

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Abstract

The Government of India has been subsidizing petroleum products, particularly diesel, kerosene under Public Distribution System and domestic Liquefied Petroleum Gas (LPG), where these products are sold below their market prices. It is argued that rising petroleum subsidies have contributed to fiscal pressures in India. The present paper attempts to compare the trend of petroleum subsidies with other forms of subsidies given by the Government of India, and then examine the impact of petroleum subsidies on key macroeconomic variables like Wholesale Price Index, GDP, gross investment, fiscal deficit and interest rate based on official data from 1992-93 to 2012-13. From a comparison with other components of gross subsidy, the study observes that it is not petroleum subsidy but food and fertilizer subsidies have grown at a sharper rate. From the use of Vector Autoregression (VAR) for the difference of logarithm of the macroeconomic variable like GDP, investment, interest rate, Wholesale Price Index and Fiscal Deficit, the study observes that the growth rate of petroleum subsidy has no significant impact on the growth rates of these variables. On the contrary, petroleum subsidy has rather been Granger caused by some of the variables like interest rate and fiscal deficit. On the basis of these observations, the obvious argument should be not to target petroleum subsidy singularly as a culprit for rising fiscal deficit and inflation. However, when we make a closer look on the amount of under-recoveries of the Oil Marketing Companies (OMCs), our argument favors periodic revision of prices of petroleum products partially accommodating the fluctuations in the crude petroleum prices without reducing subsidies for the consumers as given in cases of PDS kerosene and domestic LPG.

JEL Classification Codes: C32, E60, H20, I38

Keywords: Petroleum Subsidy, under-recoveries, macroeconomic variables, VAR, India

1. Introduction

Reduction of subsidies has been placed high in the agenda of the recent governments of India. It is argued that subsidies increase fiscal deficit and interest rates; thereby hamper the prospect of growth of the economy. Among different types of subsidies, petroleum subsidies are now viewed as a black hole in escalating the twin deficits of Indian economy. It is argued that, on the one hand, the under-priced petroleum products are responsible for high petroleum demand in the economy, which results in higher import bill and higher Current Account Deficit (CAD) and, on the other hand, these subsidies brings about higher government expenditure causing higher fiscal deficit and inflation. In addition, some studies observe that excessive subsidization of products like kerosene leads not just their inefficient use but black-marketing. Cross-subsidized products like diesel also lead to road congestion since many people prefer to possess diesel-cars instead of petrol-cars (please refer Rangarajan, 2006 and Parikh, 2010).

However, the issue is not that simple at least for two simple reasons. One, different petroleum products are important for different sections of the economy. For example, petrol may be a product for the rich, but kerosene is widely used by the poor mainly for cooking and lighting. Liquefied Petroleum Gas (LPG) is considered to be a clean source of energy consumed by both rich as well as the poor. Effect of all these items on the economy cannot be argued to be uniform. Two, when subsidies are withdrawn, the prices are allowed to hit the consumers directly. The economy faces a supply-side inflation. Apart from these, it is argued that the governments in India heavily subsidize food and fertilizer, in addition to petroleum. Given the reduction in petroleum subsidies, if other major subsidies are actually increased, then the argument from the viewpoint of 'subsidies increase fiscal deficit' would be totally out of place. The above arguments incite us for a scrutiny of the political economy of petroleum subsidies in Indian context and examine the official argument to dismantle them in a phased manner.

The objectives of the present study are: (i) to examine the trend and pattern of subsidies in petroleum sector vis-à-vis other subsidies in India, and (ii) to investigate the dynamic relationship among petroleum subsidies, prices, fiscal balance, economic growth, interest rate and investment in the economy. The remainder of the paper is organized in three sections. The Section 2 presents a cursory look on some literature. In Section 3, we have given

a brief explanation of data, key variables and methodology. The findings of our study are presented in the Section 4, whereas the Section 5 summarizes.

2. Literature Review

The literature on the impact of petroleum subsidies on macroeconomic variables is quite divided. Some recent studies have observed that petroleum subsidies are both "inefficient and inequitable". They encourage overconsumption of petroleum, delay the adoption of energy-efficient technologies, and crowd out high-priority public spending, including spending on physical infrastructure, education, health and social protection [Coady, et al.2010; Anand, et al.2013; IISD, 2012, 2012a]. Corroborating the above observation, Arze et al. (2012) find "Most of the benefits of fuel subsidies also go to higher income groups who tend to consume more". Recognition of these shortcomings has led to an active debate in India as to the merits of replacing these subsidies with better targeted measures. Therefore, fuel subsidy becomes an inefficient instrument for protecting the poor households and ascertaining equity (ibid).

Bhattacharya and Batra (2009) attempt to show differential impact of international oil prices on domestic inflation and output growth in India under two alternative scenarios. One, when domestic fuel prices are allowed a formula-based automatic alignment with international oil prices; and two, when as per the current policy, fuel prices evolve as a consequence of revisions specified periodically by the government. By using a sophisticated vector autoregressive framework using the technique of innovating accounting they concluded that "fuel prices if left free to adjust automatically to international price variations will impact inflation in a more sustained fashion. The impact of prices aligned with international oil prices in contrast with that of government regulated prices on inflation and output growth not just lasts longer but is also more magnified… A way out has therefore to be found so as to implement price reform with minimum social costs".

A recent sophisticated study using macroeconomic model which incorporates monetary and fiscal policy responses to oil price shocks in four different scenarios, finds that "in absence of any rise in international price of oil, a rise in the degree of pass-through (of higher global oil prices to the Indian economy) and reduction in oil subsidy, ceteris paribus, is likely to have adverse impacts on growth and inflation only in the short run while in the medium term, the growth improves provided the expenditure switching happens from oil subsidy to capital expenditure, and inflation declines" [Bhanumurthy, et al. 2012]. However, full pass-through reduces the current account deficit compared to no pass-through, as higher fuel prices reduce domestic oil demand and imports (ibid).

A subsequent study by Dasgupta and Chatterjee (2012) offers a different view. Their study has attempted to examine the under-recoveries, the pricing structure and surplus generated (profit) in the oil sector. They find that this profit will be sufficiently large to wipe out the much of fiscal deficit sustained by the government on account of oil subsidies-without raising the price of oil products. This view is quite akin to the view of some political parties especially of the left parties.

Different studies have taken different data and their methodologies differ. Most of these studies have done analysis by taking absolute values of macro-variables, which are prone to produce higher standard errors of estimation. The present study attempts to find the inter-relationship between the growth rates of the selected variables allowing for endogeneity.

3. Data and Methodology

Empirically, the study begins with examining the trend and growth rates of different subsidized petroleum products, viz. PDS kerosene (KS), domestic LPG (LPGS)[1], and overall petroleum subsidy (PS). The same has been compared with the growth rates of food and fertilizer subsidies. In order to measure the annual compound growth rate we have fitted *semi-log regression* models of subsidies on time variable. Data on subsidies have been taken from *indiastat.com* and for macroeconomic variables like gross investment (INVT), weighted average lending rate (WALR) as a measure of nominal interest rate, wholesale price index for all commodities (WPI) as a measure of inflation, fiscal deficit (FD), and gross domestic product at current market prices (GDP) have been taken from the *Hand Book of Statistics on Indian Economy*, *RBI*. The variables have been tested for stationarity by using ADF test and we have formulated a simple VAR model to analyze the relationships among the growth

[1] LPG meant for household purposes (termed as "domestic LPG") is bottled in 14.2 kilograms cylinders and supplied by the authorized distributors of OMCs at prices controlled by the government.

rates of the selected variables[1]. Since we expected lagged-effects, we have used Akaike Information criterion (AIC) to select the optimum lag. We found the optimum lag is 1, which is in consistent with the nature (annual) of data. The structure of the model is as follows:

$$dln\,GDR_t = \alpha_{10} + \alpha_{11} dlnGDR_{t-1} + \alpha_{12} dlnPS_{t-1} + \alpha_{13} dlnWPI_{t-1} + \alpha_{14} dlnWALR_{t-1} + \alpha_{15} dlnINVT_{t-1} + \alpha_{16} dlnFD_{t-1} + \varepsilon_{1t} \quad \text{.....(1)}$$

$$dlnPS_t = \alpha_{20} + \alpha_{21} dlnGDR_{t-1} + \alpha_{22} dlnPS_{t-1} + \alpha_{23} dlnWPI_{t-1} + \alpha_{24} dlnWALR_{t-1} + \alpha_{25} dlnINVT_{t-1} + \alpha_{26} dlnFD_{t-1} + \varepsilon_{2t} \quad \text{(2)}$$

$$dlnWPI_t = \alpha_{30} + \alpha_{31} dlnGDR_{t-1} + \alpha_{32} dlnPS_{t-1} + \alpha_{33} dlnWPI_{t-1} + \alpha_{34} dlnWALR_{t-1} + \alpha_{35} dlnINVT_{t-1} + \alpha_{36} dlnFD_{t-1} + \varepsilon_{3t} \quad \text{(3)}$$

$$dlnWALR_t = \alpha_{40} + \alpha_{41} dlnGDR_{t-1} + \alpha_{42} dlnPS_{t-1} + \alpha_{43} dlnWPI_{t-1} + \alpha_{44} dlnWALR_{t-1} + \alpha_{45} dln\,INVT_{t-1} + \alpha_{46} dlnFD_{t-1} + \varepsilon_{4t} \quad \text{(4)}$$

$$dlnINVT_t = \alpha_{50} + \alpha_{51} dlGDR_{t-1} + \alpha_{52} dln\,PS_{t-1} + \alpha_{53} dlnWPI_{t-t} + \alpha_{54} dlnWALR_{t-1} + \alpha_{55} dlnINVT_{t-1} + \alpha_{56} dlnFD_{t-1} + \varepsilon_{5t}$$

……...(5)

$$dlnFD_t = \alpha_{60} + \alpha_{61} dlGDR_{t-1} + \alpha_{62} dln\,PS_{t-1} + \alpha_{63} dlnWPI_{t-1} + \alpha_{64} dlnWALR_{t-1} + \alpha_{65} dlnINVT_{t-1} + \alpha_{66} dlnFD_{t-1} + \varepsilon_{6t} \quad \text{…….(6)}$$

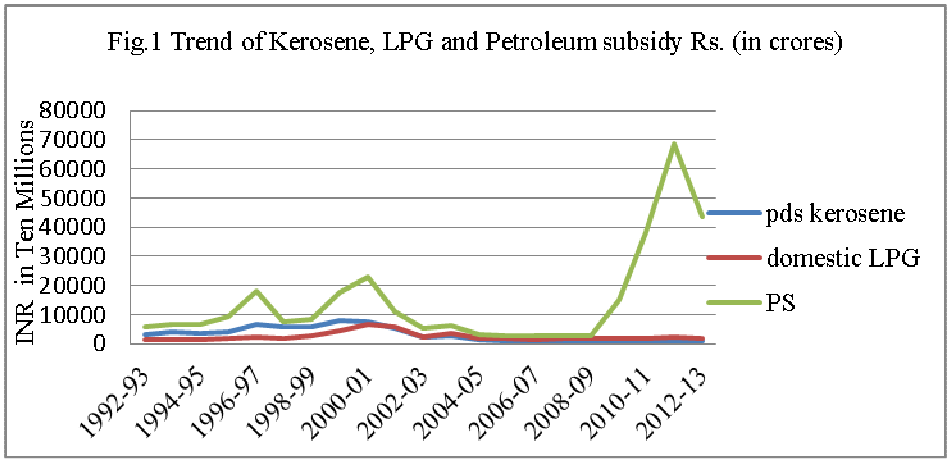
After estimating the VAR coefficients, we went for Granger causality test to verify the relationships.

4. Results and Discussion

4.1 Trend of petroleum subsidy

The unprecedented steep rise in the domestic consumption and international prices of the crude in recent years has led to an increase in the explicit subsidy bill for petroleum products from INR 52.25 billion in 2002-03 to INR 684.81 billion in 2011-12. Actually the rise has been steeper during 2008-12 (please see Fig 1). Three items viz. diesel, kerosene and LPG contribute to almost two-third of the total petroleum consumption in the country. Since 2002 reforms, when the Administered Price Mechanism (APM) has been dismantled for petrol, the government has been providing a fixed per-unit fiscal subsidy to the selected petroleum products, viz. LPG, Kerosene and Diesel.

Fig.1 Trend of Kerosene, LPG and Petroleum subsidy Rs. (in crores)



4.1.1 Kerosene and LPG: Kerosene under PDS and domestic LPG are exclusively subsidized in India. Recently there has been a shift from kerosene to LPG as a source of fuel, and to electricity as a source of lighting. The off-take of kerosene from PDS has declined. Therefore, despite rise in production price, kerosene subsidy has not

[1] The standard VAR is a reduced form model and economic interpretation of the results is often impossible, unless the reduced form VAR is linked to an economic model. The VAR methodology has been used to analyze the interrelationship between petroleum subsidies and key macroeconomic variables in India using annual data from 1992 to 2012.

been rising (actually fallen) since 2004-05. The annual compound growth rate of kerosene subsidy during 1992-2012, it is actually negative and significant (Table 1). Unlike kerosene, the compound annual growth rate of fiscal subsidy for domestic LPG, especially after 2002 has almost remained static. The growth rate is just 0.47 percent, which is statistically insignificant.

Table 1: Regression results of semilog trends: $\ln Y_t = a + bt + u_t$, n=21

Dependant variable (Y_t)	Intercept (p-value)	Slope coefficient (b) (p-value)	Annual compound growth rate (r)	Adj R^2 (p-value of F)
KS	235.9062 (0.000)	-0.1139 (0.000)	-10.77	0.6664 (0.000)
LPGS	-1.753761 (0.961)	0.0047 (0.791)	0.47	-0.0487 (0.791)
PS	-63.8 (0.368)	0.0364 (0.306)	3.71	0.0054 (0.306)

Note: b=exponential growth rate, $r = e^b - 1$, r is stated in percent.

Source: Authors' calculation

4.1.2 Petrol and Diesel: It is mention-worthy that prior to 2002, petrol and diesel prices were fixed as per the recommendations of the Oil Coordination Committee (OCC). Subsidy was not a regular phenomenon. The retail price of petrol was fully liberalized in June 2010. Even prior to this, price of petrol during 2002-10 tended to move in line with international prices so that subsidies were generally small. However, an exception occurred in 2007 and 2008 when domestic prices barely changed while international prices increased sharply, resulting in an escalation of petrol subsidies. But the steep spike in the overall petroleum subsidy graph is mainly due to diesel subsidy. In consequent with the excessive hike in crude import prices in 2008-11 and continuing rising domestic consumption, global slow-down, diesel price was not allowed to rise. Of course some correction has been noticed since the government has started acting on its intention to deregulate diesel price in a phased manner.

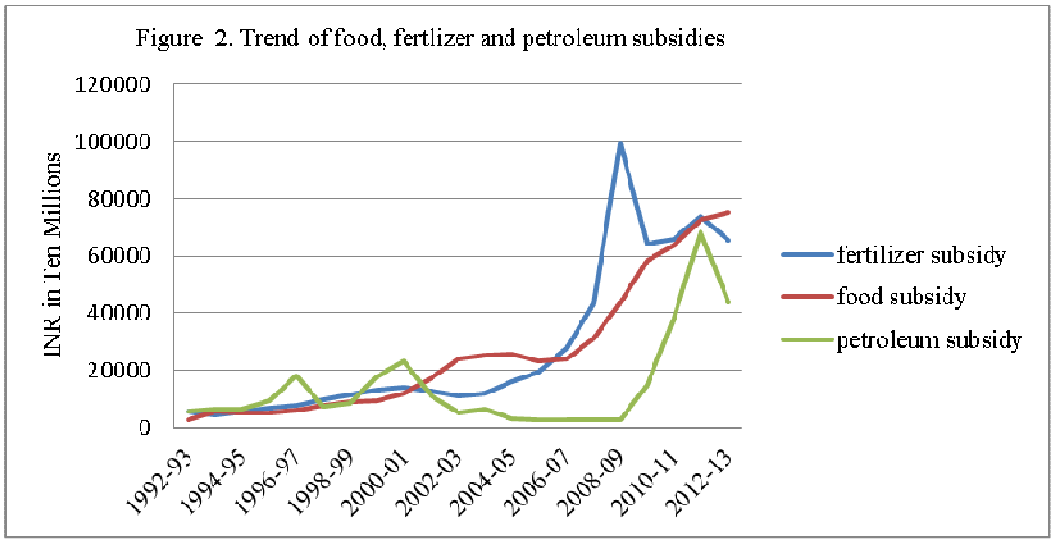
As shown in Table 1, the compound annual growth rate of overall petroleum subsidy during 1992-2012 is 3.71 percent, which is not significant statistically. This rate would have been much smaller but for the steep rise during 2008-12.

4.2 Comparison of PS with food and fertilizer subsidies

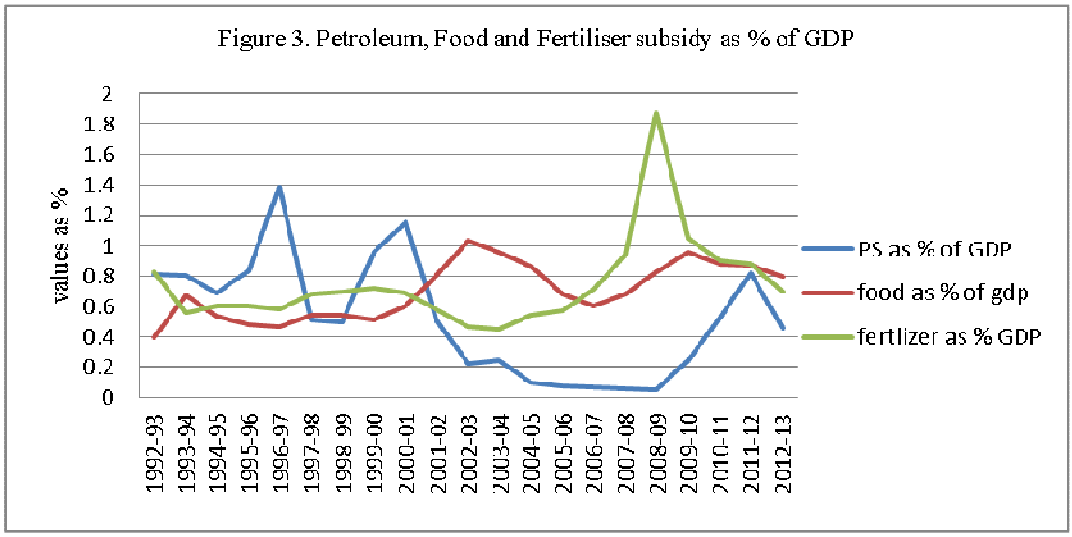
Food and fertilizer subsidies are considered to be the other important types of subsidies. In order to make a comparison, we have taken these subsidies both in absolute terms and as percent of GDP. Except for petroleum subsidy, other two subsidies witnessed sharp rise during 2001-08. Petroleum subsidy increased exorbitantly during 2008-11. Although petroleum and fertilizer subsidies have shown symptoms of fall, food subsidy is on the rising trajectory. Considering the recent enactment of the National Food Security Act, this is expected to rise further.

The Figure 2 presents the trend of food, fertilizer and petroleum subsidies. The rise in petroleum subsidy was steeper than food and fertilizer subsidy during the period 2008-09 to 2011-12. However it is noticeable that like petroleum and fertilizer subsidies, food subsidy as a percent of GDP has also started falling since 2011 (although rising in absolute term). This may be due to the fact that growth rate in food subsidy has been smaller than the growth rate of GDP.

The annual compound growth rates of these three categories of subsidies are stated in table 2. The study found that food subsidy has experienced the highest percent of annual compound growth rate followed by fertilizer subsidy. Both these have grown above 15% on an average, which are statistically significant (please see the p-values). The growth rate of petroleum subsidy has been the lowest and insignificant in this category.



Source: Ministries of Petroleum and Natural Gas, Chemicals & Fertilisers, and Agriculture, Govt. of India websites



Source: Authors' own calculation from subsidy data sources same as of Figure 2, and GDP data from RBI

Table 2.Regression results of semilog trends of PS, FS and CS: $\ln Y_t = a + bt + u_t$,

Dependant variable (Y_t)	Intercept (p-value)	Slope coefficient (b) (p-value)	Annual compound growth rate (r)	Adj R^2 (p-value of F)
PS	-63.8 (0.368)	0.0364 (0.306)	3.71	0.0054 (0.306)
FS	-302.714 (0.00)	0.15607 (0.00)	16.89	0.97 (0.00)
CS	-282.065 (0.00)	0.1457 (0.00)	15.68	0.8897 (0.00)

Note: FS= food subsidy, CS= (chemical) fertiliser subsidy. n=21

Source: Authors' calculation

4.3 Nature and relationship of the macroeconomic variables

The impact of petroleum subsidy on macroeconomic variables like GDP growth, interest rate, inflation, investment and fiscal deficit is examined by through a VAR model. Before analyzing the VAR, we have examined the stationarity of the variables by using ADF test[1]. The results are presented in the following table

Table 3. Augmented Dickey-Fuller (ADF) Test (Trend Lag=0)

Variable	Level form		First difference of log of variables	
	Test Statistics	Mackinnon Approximate p-Value For Z(t)	Test Statistics	Mackinnon Approximate p-Value For Z(t)
PS	-1.149	0.6950	-3.238	0.0179
GDP	16.848	1.000	-1.967	0.3012
FD	0.351	0.9796	-4.954	0.0000
INVT	4.814	1.000	-5.505	0.000
WPI	4.832	1.000	-3.340	0.0132
WALR	-1.084	0.7214	-2.727	0.0696

Source: Authors' calculation using STATA, n=21 for level form, n=21 for difference log, trend lag=0

ADF test is based on the null hypotheses that there is a unit root in the time series processes. That means the time series are non-stationary. All the Mackinnon approximate p- values of the variables are greater than 0.01, which indicate that these are non-stationary at level form. However, it is interesting to see that all sans GDP are stationary if we take the difference of natural logarithms of the original variables. Among the remaining variables, the computed values for all the ADF test statistics are significant at 1 percent level, except for WALR, which is significant at 7 percent level of significance. GDP is not significant at any level of significance. It is to be noted that WALR and GDP are stationary at less than 5 percent level of significance if we include drift. Thus the null hypotheses of presence of unit roots can be safely rejected. It is now confirmed that the log difference variables are stationary. Since our interest was to understand the inter-linkages of growth rates of the above variables, we have taken the difference of logarithms of the variables. Another advantage of taking log is that it smoothes the processes involving huge macro values.

The parameters of log difference provide elasticities. The impacts of some of the independent variables are not instantaneous (specifically macroeconomic variables like per capita GDP, subsidy, total investment, fiscal deficit, interest rate) and therefore we introduced lags of those variables in both linear log difference models. On the basis of AIC, the present study has taken optimal lag as 1, which is understandable considering the annualized data being analyzed.

The extent of pair-wise correlation among the selected variables is presented through the following correlation matrix.

Table 4. Correlation Matrix

	dlnFD	dlnWPI	dlnGDP	dlnWALR	dlnPS	dlnINVT
dlnFD	1.000					
dlnWPI	0.1084	1.000				
dlnGDP	0.0656	-0.5467*	1.000			
dlnWALR	0.3293	0.1811	0.0857	1.000		
dlnPS	-0.0393	0.1090	0.4579*	-0.1858	1.000	
dlnINVT	-0.4429*	0.0602	0.2253	-0.3776*	-0.1525	1.000

Source:-Author's calculation using STATA,* indicates significant at 5 percent level

[1] Unless stationary, variables will be prone to spurious correlation and their interrelationship will be misleading

The study observes that as per expectation, there is negative relationship between interest rate and investment, but positive correlation between interest rate and fiscal deficit, and fiscal deficit and inflation. As regards petroleum subsidy (PS), the study finds that it is positively correlated with growth rate but negative with fiscal deficit.

4.4 Results from VAR analysis

It is observed from the table 5 that equations involving dlnGDP, dlnWPI and dln WALR in the left hand side manifest significant impact. The p-value of chi square for these equations are 0.0035, 0.000 and 0.0220 respectively, whereas for all other equations the p-values are greater than 0.05.

FPE= 1.69e-13, Det(Sigma_ml)=1.63e15, AIC=-12.60212, SBIC=-10.51441, and HQIC=-12.51441, n=19

Table 5. VAR Estimation

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnFD	7	.285914	0.1596	3.608001	0.7295
dlnGDP	7	.024777	0.5058	19.44256	0.0035
dlnPS	7	.4367	0.7026	44.88211	0.0000
dlnINVT	7	.106979	0.2036	4.857741	0.5622
dnlWPI	7	.024867	0.2318	5.733343	0.4537
dlnWALR	7	.046933	0.4377	14.78904	0.0220

Source: Authors' own estimation based on STATA

The coefficients of the VAR concerning petroleum subsidy are presented in the figures below

Fig. 4 Sign of AR coefficients of other variables on dlnPS and p-values

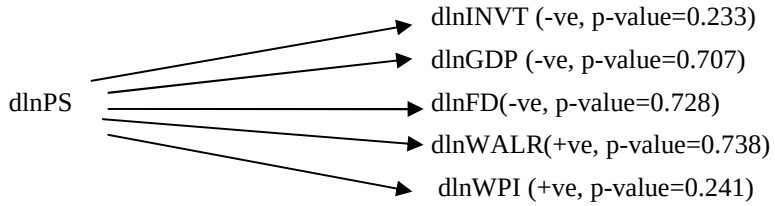


Fig. 5 Sign of AR coefficients of dlnPS on other variables and p-values

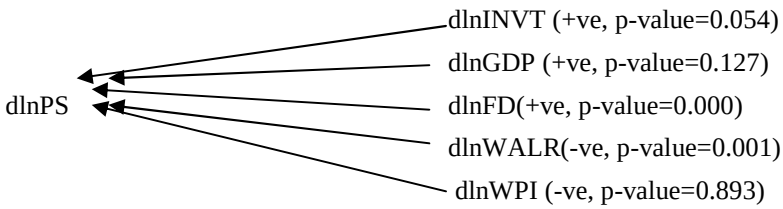


Fig 5 explains that PS does not influence any of the chosen macro-variables significantly but INVT (investment), FD and WALR (interest rate) influence PS significantly.

The study observes that subsidy has no significant impact on the selected key variables. Although not significant, dlnPS is likely to reduce dlnGDP, dlnFD and dlnINVT but positive impact on dlnWALR and dlnWPI (fig 4). The signs are on the expected lines. Higher amount of subsidies have the potency to reduce the availability of fund for capital formation.

On the contrary, as explained in figure 5, dlnINVT and dlnGDP have positive impact on dlnPS. It is not surprising that these two are indicators of good times, where government can wait to pass through prices of petro-products to consumers. So is the impact of dlnWALR. However, dlnFD surprisingly has positive impact on dlnPS. This is possible if fiscal deficit increases inflation and current account deficits, which may again be aggravated by exogenous rise in crude oil prices, then unit-based consumption subsidy may go up.

It is now important to observe the Granger Causality test to see if a variable is Granger causing other variables in the present framework.

Table 6 presents the results of Granger causality test[1]. The study finds that dlnFD and dlnWALR Granger cause dlnPS. From the VAR table, the coefficient for dlnFd is positive, whereas it is negative for dlnWALR (p-values<0.05). The p-value of wald chi-squae is slightly greater than 0.05 for dlnINVT. It may be stated that investment also Granger causes PS. But PS does not Granger cause any of these variables.

Table 6. Results of Granger-Causality test

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. vargranger

  Granger causality Wald tests
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Equation	Excluded	chi2	df	Prob > chi2
dlnFD	dlnGDP	.90245	1	0.342
dlnFD	dlnWPI	.53609	1	0.464
dlnFD	dlnINVT	.07287	1	0.787
dlnFD	dlnPS	.12076	1	0.728
dlnFD	dlnWALR	1.1027	1	0.294
dlnFD	ALL	3.0241	5	0.696
dlnGDP	dlnFD	1.3581	1	0.244
dlnGDP	dlnWPI	.00019	1	0.989
dlnGDP	dlnINVT	.96972	1	0.325
dlnGDP	dlnPS	.14139	1	0.707
dlnGDP	dlnWALR	.39366	1	0.530
dlnGDP	ALL	3.1014	5	0.684
dlnWPI	dlnFD	.18958	1	0.663
dlnWPI	dlnGDP	.31659	1	0.574
dlnWPI	dlnINVT	5.5e-05	1	0.994
dlnWPI	dlnPS	1.3726	1	0.241
dlnWPI	dlnWALR	.00438	1	0.947
dlnWPI	ALL	4.4802	5	0.483
dlnINVT	dlnFD	.69273	1	0.405
dlnINVT	dlnGDP	1.2027	1	0.273
dlnINVT	dlnWPI	.36236	1	0.547
dlnINVT	dlnPS	1.4246	1	0.233
dlnINVT	dlnWALR	.1288	1	0.720
dlnINVT	ALL	3.4325	5	0.634
dlnPS	dlnFD	28.81	1	0.000
dlnPS	dlnGDP	2.3283	1	0.127
dlnPS	dlnWPI	.0181	1	0.893
dlnPS	dlnINVT	3.7166	1	0.054
dlnPS	dlnWALR	10.495	1	0.001
dlnPS	ALL	42.026	5	0.000
dlnWALR	dlnFD	6.1096	1	0.013
dlnWALR	dlnGDP	.36687	1	0.545
dlnWALR	dlnWPI	1.8317	1	0.176
dlnWALR	dlnINVT	.01912	1	0.890
dlnWALR	dlnPS	.11196	1	0.738
dlnWALR	ALL	13.41	5	0.020

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Source: Authors' calculation using STATA

4.5 A note on under-recoveries

The discussion may be conceived as half true if we do not mention a few lines on under-recoveries of Oil Marketing Companies (OMCs). The issue of under-recoveries was examined in detail by the Committee on Pricing and Taxation of Petroleum Products (GOI, 2006) headed by C. Rangaranjan. According to this report,

[1] Granger (1969) proposed a time-series data based approach in order to determine causality. In the Granger causality x is a cause of y if it is useful in forecasting y. In this framework "useful" means that x is able to increase the accuracy of the prediction of y with respect to a forecast, considering only past values of y. A common method for testing Granger causality is to regress y on its own lagged values and on lagged values of x and tests the null hypothesis that the estimated coefficients on the lagged values of x are jointly zero. Failure to reject the null hypothesis is equivalent to failing to reject the hypothesis that x does not Granger cause y. The conventional Granger Causality tests in an unrestricted VAR framework is conditional on the assumption that the underlying variables are stationary or in integrated of order zero in nature.

the difference between the cost price and realized price represents the under-recoveries of the OMC. In fact the fiscal subsidies are very small when compared with these under recoveries. A large part of these under-recoveries is compensated for by additional cash assistance from the Government (over and above the fiscal subsidy), while another portion is covered by financial assistance from upstream National Oil Companies (NOCs), which are engaged in exploration and production of oil and gas. The remaining portion remains uncompensated to the OMCs.

The quantum of under-recoveries incurred by OMCs on the sale of sensitive petroleum products, viz. HSD, domestic LPG and PDS kerosene have increased from INR 400 billion in the year 2005-06 to INR 1610.29 billion in 2012-13,which is about 2.4 times the amount of fiscal subsidy on all petroleum products. Assuming an average crude price of US $ 130 per barrel, under-recoveries for HSD, PDS kerosene, Domestic LPG in 2012-13 are estimated to be INR 920.61 billion, INR 395.58 billion and INR 294.10 billion respectively (Please refer table 7).

Table 7 Under-recovery of Petroleum product by OMCs (INR million)

Petroleum Products	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13[4]**
Petrol	27230	20270	73320	51810	51510	22270	-	-
Diesel	126470	187760	351660	522860	92790	347060	811920	920610
Domestic LPG	102460	107010	155230	176000	142570	217720	299970	395580
PDS Kerosene	143840	178830	191020	282250	173640	194840	273520	294100
Total	**400000**	**493870**	**771230**	**1032920**	**460510**	**781900**	**1385410**	**1610290**

Source: Petroleum Planning & Analysis Cell 2012

Note: [4] represents estimated figures

This is noteworthy here that there has been a significant debate in India over the appropriateness of 'under-recoveries' as a category for measuring the burden of current pricing policy on OMCs. In order to lessen the burden of under-recoveries, the central Government developed the Equitable Burden Sharing Mechanism (EBSM). Under this, it was agreed that India's upstream public oil companies like Oil and Natural Gas Corporation (ONGC), Oil India Limited (OIL) would shoulder one third of the burden of under-recoveries.

Nonetheless, when we look at these figures, our conclusion would neither be that petroleum subsidies have grown insignificantly nor that they don't granger cause fiscal deficit, higher interest rate, etc. The true statement would be if we take under-recoveries as concealed subsidies then the conclusion is likely to be U-turned. The accounting mechanism and data non-availability restricts for an empirical analysis as such.

5. Summary and conclusions

The study observed that petroleum subsidy including PDS kerosene; domestic LPG and diesel have been fluctuating since 1992, albeit there was near stability during 2004-08. Kerosene and LPG subsidies are stagnant since 2002, but diesel subsidy has been volatile. Further to add that petroleum subsidy has not actually increased as faster as food and fertilizer subsidies. This indicates that petroleum subsidy may not be blamed as a prime culprit for rising fiscal deficit.

Secondly, from the VAR analysis, we observed that although petroleum subsidy has no significant impact on investment, economic growth, fiscal deficit, inflation and interest rate. Interest rate has also some negative effect on petroleum subsidy. Fiscal deficit has significant impact (positive) on petroleum subsidy. This empirical approach has been to investigate effects of petroleum subsidies at the margin; these hypotheses are tested by examining the sign and significance of the coefficients on the subsidy variable.

The study finds that petroleum subsidies do not hamper economic growth significantly. However, when we take the quantum of under-recovery, this conclusion looses strength. There should be an approach to incorporate both subsidies and under-recovery of OMCs together to understand their impact on key macroeconomic variables as well as different sections of consumers. Non-availability of data has come as a problem which needs to be addressed by the concerned departments and officials.

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