Abstract

The petrol tax is an instrument for fiscal policy as well as transport, energy and environmental policy. The purpose of this study is to estimate and discuss some of the policy-relevant effects of petrol tax changes.

In Sweden 90 % of the total petrol consumption can be ascribed to passenger cars. Therefore the analysis is concentrated to them.

Total annual petrol consumption by cars, B can be written as a product of four factors:

$$B = \text{Population} * \frac{\text{Cars}}{\text{Population}} * \frac{\text{Km}}{\text{Cars}} * \frac{\text{Petrol consumption}}{\text{Km}}$$

A review of the vast literature on the *price-elasticity* of the demand for petrol, gives a rather mixed impression. For a more penetrating analysis of this matter than is possible by econometric studies of aggregate demand for petrol, the present approach seeks to separate the extent to which each of the following variables is affected by changes in the price of petrol:

(i) car ownership
(ii) car use
(iii) petrol consumption per km

Such a separation allows resolving the most difficult estimation problem in this connection: the fact that some of the underlying determinants including chronological time are strongly correlated with one another.

The estimates show that in Sweden the sum of part-effects (i) and (ii) results in a petrol-price-elasticity with respect to *car traffic* equal to – 0.2 in the short run, and – 0.3 in the long run. Because of different possibilities to increase the average fuel efficiency in the car

fleet, the petrol-price-elasticity of *petrol demand* is substantially greater (in absolute terms): – 0.3 in the short run, and of the order of – 0.7 in the long run. (It is uncertain whether the long-run price elasticity found in the past remains reasonably stable in the future.) So much is clear: A petrol price rise is a considerably more effective measure for energy and environmental policy than for transport policy.

For budgetary policy it is important to know what happens to total tax revenue when the petrol tax is changed. In the absence of "leakages", for example reduced income from other taxes, the petrol-tax-elasticity of total petrol tax revenue equals the product of the petrol-price-elasticity of the demand for petrol and the ratio of the petrol tax to the final petrol price plus unity. By this formula, the elasticity of total tax revenue with respect to the petrol tax is about 0.8 in the short run, and 0.5 in the long run – provided that nothing else changes.

However, to calculate the total effect of petrol tax changes on the financial balance of the "consolidated public sector", a number of additional factors have to be taken into account. Due to several "leakages" a petrol tax rise will make a rather modest improvement of that balance. A numerical example shows that another krona of petrol tax (plus 25 öre vat on the tax) will yield a net improvement of one thousand million kr (Sw.cr.) in the long run. This net effect can be compared to the hypothetical total increase in petrol tax revenue that is maximally obtainable by such a petrol tax rise, i.e. 1.25 kr times the current total petrol consumption (in litres), which would be a good seven thousand million kr.

In the last two chapters of the study the regional welfare distribution effects of petrol tax rises are looked at. Like other price increases a petrol price rise (induced by a tax increase) reduces the *consumers' surplus* in the market concerned. This can be expressed in monetary terms, and is the best measure of the welfare loss. Regional differences in this respect arise mainly because the petrol consumption per car is different at present in different regions.

The calculation of the reduction in consumers' surplus shows that at rise of the petrol tax by 1.25 kr (including vat) results in an annual welfare loss which is 200–300 kr greater for the representative motorist in the northern, thinly polulated areas, than the welfare loss for the average Swedish motorist. On average 250 kr is 0.1 % of a household's total expenditure.