

Excise Taxes on Gasoline and Suppliers' Market Power: A Note

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Abstract: The present paper claims that in the retail gasoline industry, excise taxes, which amount to a substantial part of prices in many countries, increase the firms' market power by reducing demand elasticity as perceived by suppliers. To neutralize this effect, a "flexible value tax" on gasoline is proposed.

I. Literature on the gasoline market

Many effects of excise taxes on gasoline have been discussed in the literature, we shall not give a comprehensive overview here. One line of arguments concerns the distribution of rents between oil-producing and oil-consuming countries. With fixed supply of a factor, in a static framework a tax entirely must fall on the supplier of the good. Further, even a monopoly has limited power to increase prices of exhaustible resources vis a vis a competitive market, which was shown in a seminal paper by Stiglitz (1976). Bergstrom (1982) extended the analysis to a dynamic setting and proved that for a depletable resource and a single oil-consuming country (or a monopoly of countries), an excise tax will not alter the consumer price in a dynamic model either, but the entire burden of the tax falls on the supplier, just as in a static competitive framework. With many countries, results will be changed if nations are not able to collude perfectly and maintain high excise taxes on gasoline. This has finally inspired a string of literature about the "battle for resource rents", where game theoretical models are applied to investigate the behavior of the players in the oil-game. E.g. Amundsen and Bergman (2005) show that acting under the realm of Kyoto, oil-consuming countries maximize the rent acquisition from oil producing countries. Further, they explain how oil producers may constrain this possibility by exercising market power.

Other papers have been dealing with the choice of the excise tax on gasoline from efficiency grounds: Which level would be chosen by a welfare maximizing planner that aims to take account of all types of externalities from gasoline consumption? Parry and Small (2005) investigate the level of gasoline taxes in the US and in Great Britain by taking account of four externalities: the most important one concerns congestion, second and next important is the "Ramsey tax" (a component that reflects the appropriate balance between excise tax and labor taxes in financing the government's budget), which is thirdly followed by costs of accidents, and fourthly by negative externalities of air pollution (the authors stress that ironically, this is the only component for which the fuel tax is approximately the right policy instrument).

Another strand of the literature concerns the retail gasoline industry and investigates market power of firms vis á vis consumers as depending on market shares, the existence of discounters, and local conditions (See e.g. Sen 2005, who uses data of 11 Canadian cities, Van Meerbeek 2003, who looks at prices of gasoline in Belge, or Clemenz and Gugler (2006), who investigate the case of Austria; Hastings (2004) investigates pricing of a substantial share of gasoline stations in San Diego and Los Angeles). By and large, these studies show empirically that both the presence and the market share of small competitors (by lowering the overall degree of market concentration) does lower the price level. Hence, the existence of small competitors also induces high quality incumbents to lower their prices and to focus on local price differentiation instead (Netz and Taylor 2002).

The present contribution remarks that the specific type of excise taxation of gasoline - whether chosen for environmental reasons or to fight for the rents of oil - by its mere size increases market power of firms in the retail gasoline industry. A large proportion of the gross price being given by a

fixed tax (the sum of the excise tax and VAT), gross prices react only alleviated to a change of net prices, as the amount of the excise tax stays constant. Hence, demand elasticity as perceived from the supplier's viewpoint is dampened, inducing them to increase the markup of prices above marginal costs to a higher degree than in a situation with proportional value taxation. Given the fact that over time, short-run demand elasticity in this market seems to have declined over the last decades because of structural shifts anyways (see e.g. Hughes, Knittel and Sperling 200, who argue that consumers depend more on cars today than during the 80-ies and 90-ies), it might be favorable to adopt a new kind of taxation on gasoline, and to eliminate the profit-enhancing effect of excise taxes. Accordingly, a "flexible value taxation" will be proposed below. While involving only little costs, this instrument could contribute to increase the degree of competitiveness of gasoline retail markets and favor consumers by changing the market structure for suppliers.

Gasoline taxes within the EU

Within the European Union, gasoline prices differ substantial (see tab.1). Nonetheless, in most countries, duties are sufficiently high to make up for a substantial share of the price of gasoline for consumers. In each country, the price increase of the excise tax is reinforced by the VAT. Excise taxes being fixed, the gross tax mark up including VAT is fixed as well (in other words, the VAT is similar to a hidden excise tax on gasoline). Hence we focus on this magnitude to compare the impact of taxes on allover gasoline prices in the EU.

The (unweighted) average price of the total tax (excise tax + VAT on excise tax) was 0,59 €-cent per litre (1. July 2009). Of course, this is substantially more than the supply price of gasoline.

Gasoline Taxes in the EU – Unleaded Petrol, 1. July 2009			
	excise dutys (< 98 oct)		
	in €/1000 litres	VAT %	duty/liter, €-cent
NL	700,70	19,0%	83,4
DE	669,80	19,0%	79,7
UK	684,30	15,0%	78,7
FR	639,60	19,6%	76,5
BE	613,60	21,0%	74,2
PT	583,00	20,0%	70,0
DK	556,80	25,0%	69,6
IT	564,00	20,0%	67,7
SE*	510,27	25,0%	63,8
IE	508,80	21,5%	61,8
SK	514,50	19,0%	61,2
CZ	483,10	19,0%	57,5
HU	451,10	25,0%	56,4
PL	448,19	22,0%	54,7
MT	459,40	18,0%	54,2
LU	464,60	15,0%	53,4
AT	442,00	20,0%	53,0
LT	434,40	19,0%	51,7
ES	424,70	16,0%	49,3

EL	410,00	19,0%	48,8
EE	398,00	20,0%	47,8
LV	379,40	21,0%	45,9
BG	350,20	20,0%	42,0
RO	335,70	19,0%	39,9
CY	298,70	15,0%	34,4
(unweighted) average			59,0
Source: European Commission (2009)			

A simple model

A most simple model is set up to realize the impact of excise taxes in the gasoline retail market. Let p be the gross price at the gasoline station, p^n stands for supplier's net price, and T for the excise tax. Further, t measures the tax rate of the VAT. Then

$$(1) \quad p = (p^n + T)(1+t)$$

holds. Firms maximize profits by choosing net prices of their products:

$$(2) \quad \text{Max } (p^n - c)q[p(p^n)]$$

Where c indicate (constant) marginal costs.

The corresponding first-order condition is derived as:

$$(3) \quad q + (p^n - c) \frac{dq}{dp} \frac{dp}{dp^n} = 0.$$

Let $\epsilon = \frac{dq}{dp}(p/q)$ be demand elasticity. Then (3) can be rearranged to

$$(4) \quad (p^n - c)/p^n = -1/(\gamma\epsilon),$$

where $\gamma = (\frac{dp}{dp^n})(\frac{p^n}{p})$ measures the elasticity of gross price with respect to net price. Now from (1) it follows that:

$$(5) \quad \gamma = [1 - T(1+t)/p]$$

For $T > 0$ it follows that $\gamma < 1$. Hence, equation (4) indicates that the mark-up of prices above marginal costs will be larger than the usual value (i.e. $-1/\epsilon$) in the absence of an excise tax.

The intuition behind this result is simple: as the excise tax does not change with the net price, gross prices react only alleviated to a change in net prices of gasoline. This induces firms to choose a higher mark-up of prices above marginal costs.

To conclude, the high level of the excise tax, while on the one hand reducing the rents of oil-producing countries, on the other hand strengthens the market position of firms in the retail industry.

Quantitative impact

The quantitative impact of the above effect in the gasoline market is strong indeed. For a realistic average gross output price of € 1,1 per litre, and an average excise of € 0,416 and for a VAT rate of 20%, gross excise tax per litre equals the average EU-value of 0,59 (see tab. 1). In this setting, taxes make up about 54% of the total price. Then γ can be derived as 0,46, and the profit-maximizing mark-up more than duplicates according to (4).

„Flexible value“ taxation

If the excise tax would be replaced by a pure value tax, $T=0$ holds and the above mechanism would not work at all. In this case, demand elasticity would at once be more than doubled from the viewpoint of firms!

Given the long-run volatility of the oil-price, it may be hard to accomplish a value taxation at the contemporary levels of taxes, since a world-wide shortage of oil would result in even higher prices for consumers (Indeed, from the rent-seeking point of view, value taxes might be more favorable for oil-consuming countries in the long-run when the oil-price should move upwards; this question, however, will not be dealt with in the present paper).

Still, a “flexible value taxation” that periodically corrects for the *level* of the oil price while holding tax revenues per litre more or less constant could do the job. Assume that the level of the value tax would be chosen as a function of the average price of oil of the previous period (e.g. a month), so that the amount of tax per litre would stay constant:

$$(6) \quad t * p^{oil(-1)} = \text{const.}$$

The tax rate could be fixed to deliver an equivalent tax revenue per litre as the current system (e.g. € 0,59).

At the stage of the retail market, firms would take the tax rate as given exogenously. A strong incentive to lower the mark-up of prices above marginal costs would be present, as demand elasticity would be more than doubled instantaneously. One might expect that prices of gasoline might be lowered for consumers.

In the long run, when the oil price might increase, the “flexible rate” would be recuded step by step.

Conclusions

Many considerations suggest that heavily taxing gasoline is a favorable strategy for oil-consuming countries, both for efficiency reasons and for reasons of capturing the rent on an exhaustible resource. As an instrument of taxation, high excise taxes have been chosen. At the same time, however, this tax instrument increases the market power of firms in the retail industry, as it reduces perceived demand elasticity and induces higher mark-ups of prices above marginal costs. A “flexible value tax” that seeks to hold tax revenues per litre constant while adapting the level of the tax rate periodically to a changing price of raw oil, could do the job to create high and relatively constant tax revenues on the one hand while not providing firms in the retail market with more than necessary market power.

References

- Amundsen, E.S., L. Bergman, (2005), International redistribution of resource rents: an alternative perspective on the Kyoto process, MPRA Working Paper No. 10642, Munich, Germany.
- Bergstrom, Th. C. (1982), On capturing oil rents with a national excise tax, *American Economic Review*, Vol.72 No.1, 194-201.
- Clemenz, G., K.Gugler (2006), Locational choice and price competition: some empirical results for the Austrian retail gasoline market, *Empirical Economics* 31: 291-312.
- C.a. Dahl (1979), Consumer adjustment to a gasoline tax, *The Review of Economics and Statistics*, Vol 61, No. 3(Aug., 1979), pp. 427-432.
- European Commission (2009), Excise duty tables – Part II, Energy products and electricity, Directorate General, Taxation and Customs, Ref. 1.029, Bruxelles.
- Netz, J.S.; B.A. Taylor (2002), Maximum or minimum differentiation? Location patterns of retail outlets, *The Review of Economics and Statistics* 84 (1), 162-75.
- Hastings J.S. (2004), Vertical relationships and competition in retail gasoline markets: Empirical evidence from contract changes in Southern California, *American Economic Review* 94 (1), 317-28.
- Hughes, J.E., CH.R.Knittel, D.Sperling, (2006), Evidence of a shift in the short-run price elasticity of gasoline demand, NBER Working paper 12530, Cambridge, Massachusetts.
- Parry, I.W.H., K.A. Small, (2005), Does Britain have the right gasoline tax? *American Economic Review* Vol.95 No. 4, 1276-89.
- Sen, A. (2005), Does increasing the market share of smaller firms result in lower prices? Empirical evidence from the Canadian retail gasoline industry, *Review of Industrial Organization* 26: 371-89.
- Stiglitz, J.E. (1976), Monopoly and the rate of extraction of exhaustible resources, *American Economic Review*, Vol.66, No.4, 655-661.
- V. Meerbeck, W. (2003), Competition and local market conditions on the Belgian retail gasoline market, *De Economist* 151 (4), 369.88.