PER-UNIT TAXES VERSUS BUSINESS LICENSES

Transferable quotas are identical to a per unit tax. In this sense, the study of taxation is another venue for the analysis of the competitive market equilibration.

Consider two different plans to raise state tax collections. Both plans will tax the retail sales of gasoline. One plan imposes a per unit tax, i.e., a fee imposed on each unit of output sold. The other plan imposes an annual fixed license fee for the right to operate in the state, i.e., a tax on the facilities at which gasoline is sold. *Both plans are designed to raise exactly the same amount of total tax revenues*. Several questions are raised by these alternative proposals:

a. In the long and short run, which plan will raise price more?
b. In the long and short run, which plan will have the greater impact on the number of firms in the industry?
c. Which plan is more efficient, that is, which has the least dead-weight loss?

To answer these questions, it is valuable to make some simplifying assumptions. First, let's assume that all gasoline retail establishments are identical. This is obviously not correct as an empirical matter, but let's develop the analysis that way and see what we get. We can then modify the assumption if it appears to result in empirically unsupportable conclusions. Further, let's assume that the retail gasoline business is competitive.

The short run is defined as the period during which the number of firms in an industry is fixed. Hence, in the short run, the per firm demand curve does not shift. The per unit tax in the short run shifts the MC of the firm up. This new MC intersects the per firm demand curve at a higher level. This then describes the new market equilibrium. The per firm tax has no effect on MC. Hence, in the short run it has no effect on market price. In answer to part b, in the short run, neither tax plan has any effect on the number of firms because that is the definition of the short run.

What happens to the number of firms in the long run is the real question. In the case of both taxes, the number of firms falls. In the case of the unit tax, the MC and AC curves shift up horizontally by the amount of the tax. The number of firms in the industry will decline until the per firm demand curve again intersects the new AC at its minimum point.[1] Call this new number of firms, n_1, and the per firm demand, $d(n_1)$, as shown in Figure 1. The new equilibrium price is P^*. The difference between P^* and ac_1 is the amount of the per unit tax. The total tax collections are (P^*-ac_1) times q_1 times n_1.

Now let's consider whether it is possible that the per firm tax could result in the same tax revenues at the same market equilibrium price, P^*, as the unit tax? For this price to prevail in the case of a per firm tax, the per firm tax would have to be large enough to drive down the number of firms to n_2. This is shown as n_2 and $d(n_2)$ in Figure 1. The per firm tax while levied as a lump sum can be measured in terms of the area of a rectangle in Figure 1. The per firm tax that generates a market equilibrium price of P^* is (P^*-ac_2) times q_2.

The question is, are the tax revenues from the per unit tax less than, equal to, or greater than the tax revenues from the per firm tax? That is,

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[1] We assume that the industry is constant cost. That is, resource prices do not change as the number of firms in the industry and industry output changes. Modifying this assumption makes the problem much more complicated expositionally, but does not affect the conclusions.

$$(P^* - ac_1) \cdot q_1 \cdot n_1 > < (P^* - ac_2) \cdot q_2 \cdot n_2$$

This is answered easily. Market equilibrium output at P^* must be the same. Hence,

$$n_1 q_1 = n_2 q_2$$

and since $ac_2 > ac_1$, taxing by imposing a per firm tax generates less revenues than are obtained by imposing a per unit tax.

In order to gain the same level of revenues, an even larger per firm tax must be imposed. This will cause the number of firms to fall below n_2 and market price to rise above P^*. Thus, the per unit tax is more efficient than the business license or per firm tax.

The conclusion makes intuitive sense. A per firm tax allows firms to "avoid" the tax by becoming larger, which they will do. Taxing authorities in order to meet their revenue target must increase the per firm tax. When firms become larger in order to avoid a tax like a business license, they produce in an inefficient manner with regard to their use of other inputs.

The conclusion does not appear to be severely limited by the assumption that all firms are identical. The retail gasoline industry is arguably composed of two types of firms: convenience store gas stations and gas stations that provide some repair service. If we were to add this complication to the model, the result would still be that a per unit tax is more efficient. With a per firm tax, firm can avoid the tax by getting larger. The per firm tax would bias the choice between convenience stores and repair station towards the type that can get larger more cheaply. Thus, a per firm tax would probably favor convenience stores.

The analysis of per unit versus per firm taxes can be extended to comparison of sales versus per unit taxes. A sales tax shifts the average and marginal cost curves differently than a per-unit tax. A sales tax shifts the marginal cost up at an increasing rate. This causes average cost including the tax to shift up and to the left. The minimum of average cost with a sales tax will lie to the left of the minimum of the average cost that includes only resource expenditures. Hence, the competitive equilibrium will be characterized by production at a smaller scale than would be optimum in the absence of the tax. This implies that a sales tax is also inefficient compared to a per-unit tax.

However, the analysis of the taxation must include the cost of collection and enforcement. While per-unit taxes may be theoretically more efficient than other taxation methods, per-unit taxes can only be used where there is some constant standard of the unit of a good. If units can be redefined after the imposition of a tax, firms will seek to avoid the tax in this fashion. Things like gasoline, tires, and cigarettes have reasonably immutable standards of a unit. Per-unit taxes can be and are used in these cases. However, most of the items that we buy at the grocery store come in various sizes. Thus, a sales tax is more efficient in terms of collection and enforcement.

Figure 1: Cost Shift with Per Unit Tax