Strategical Behavior of Firms and Excise Tax Payment (Revenue Maximization, Profit Maximization, Love, Respect and Trust)

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Abstract

In this paper, we analyze the effect on price and quantity traded of a commodity of an excise tax payment under different conditions. First, we analyze the effect of the tax payment as in traditional analysis, where the firm considers tax as a "bad" to be avoided. Next, we propose a new approach for sharing the payment for the firm. Finally, we develop a new philosphical and psychological analysis wehere tax payment may be considered as a "good" to be happily provided by the firm rather than a "bad" that needs totally to be avoided.

Keywords: Market equilibrium, Excise tax, Firm strategy, Cost minimization, Revenue maximization, Profit maximization.

1. Introduction

In traditional microeconomic analysis, the excise tax payment is considered as a "bad" to be avoided, and therefore producers are assumed to transfer all of the tax payment to the consumers. This would mean an upward shift of the supply function by the amount of the excise tax, resulting in an increase in the equilibrium price of the good as well as a decrease in equilibrium quantity traded. The resulting situation is worse than the initial condition for consumers since the price has increased, and also bad for the producers since declining quantity at an elastic portion of the demand curve would also mean decreasing total revenues.

In this paper, we analyze different strategies that the firm may apply faced with the excise tax payment. The first of these alternative strategies is to consider the excise tax as a "good" to be provided, rather than a "bad" to be avoided. This can only happen if the owners of the firm are benevolent citizens, who by means of paying higher taxes believe that the government will spend the tax proceeds for the benefit of the citizens (rather than for partisan reasons) and therefore, will increase the welfare of all the citizens of the country. Nevertheless, this strategy should at least be as good as the initial strategy for the firm for it to be feasible to begin with.

Another strategy is to keep the supply function as it was before the application of the excise tax. In other words, the firm behaves as if the excise tax has not been applied and keep producing as it would without the tax. This strategy would be a better profit maximizing strategy for the firm if the resulting outcome is higher than those obtained from the initial strategy of transferring all of the excise tax payment to the consumers.

Actually, the firm may choose any combination of these strategies by means of a simple linear weighted average rule (according to the objective function chosen), thereby partially transferring the tax payment on the consumers, or partially considering the tax as a "good" to be provided.

Since the analysis involves the knowledge of basic microeconomics, our essential references are an introductory economics book, Parkin (2005), and a managerial economics book, Baye (2009). Throughout the analysis we assume that the firm has enough market power (for example by differentiating its product) so that it faces a downward sloping demand curve for its product.

Furthermore, the strategic behavior of firms towards excise tax payment may be analyzed in the framework of whether the firm is a revenue maximizer or profit maximizer. Moro (2008) summarizes the previous work done in comparing these two strategies in his paper. In the paper, he argues that manager motives may be more inclined towards revenue maximization with separation of ownership and control of the firm. He mentions that strategic choice variable also depends on the corporate culture. For example, Japanese firms are principally growth and market-share oriented, which means they are revenue maximizers, whereas US corporations which rely more on short run investment returns and capital gains, are profit maximizers. Even though in the paper he concentrates more on the technical aspects of revenue maximization, like the capital labor ratio declining in a revenue maximizing firm, compared to a profit maximizer and a static revenue maximizing firm sets the average product of labor equal to the wage rate, its importance for our purposes lies in summarizing the previous literature about revenue maximization as a valid strategic alternative for firms. As an example of another work in this area we give Miller and Pazgal's paper (2002), which focuses on strategic choice of manager type if the competitive environment of the firm necessitates a more aggressive stance towards rivals including revenue maximization. Whereas revenue maximization and profit maximization are two points at the extreme, a firm may as well choose any strategy between the two in a linear weighted average rule framework. Revenue maximization may also be chosen as strategic variable subject to a profit constraint such that the profits are equal to zero, or a specific positive value.

Even though it is not comprehensive, and is not intended to be so, we give two further works done in this area as examples, one of which is Tabeta, N., Ruifang, W.'s 1996 working paper ""Relative" Revenue Maximizing Strategy Under Duopolistic Competition: The Case of US-Japan Bilateral Auto Trade", where they argue that the success of Japanese auto manufacturers against US counterparts in bilateral trade is as a result of their use of a revenue maximizing strategy rather than profit maximization. In another working paper. Zitzewitz, E., 2002, "A Strategic Rationale for Imperfect Profit Measures" the author argues that the use of imperfect profit measures by the owners may encourage the managers towards the use of a more aggressive competitive strategy of revenue maximization rather than that of profit maximization. "Aggressive" here is a relative term, which refers to the increasing competition for the rivals, but which may be beneficial for the consumers and the society as a whole.

Apart from the existing literature about revenue or profit maximization, we want to stress **a new dimension in our paper that there may be a paradigm shift from "maximizing own benefit" to "maximizing the benefit of all".** In this regard, we have a series of papers which stresses the application of the paradigm shift to different problems, and interested readers may have a look at them. For example, Seber (2011b) tries to find a solution to the Global Warming problem by a change in production processes considering the environmental impacts as well, as a result of which the supply and demand functions coincide. Seber (2011c) uses this paradigm in an educational problem in an organizational setting and the way to increase efficiency and enable the students to reach their potential is teamwork rather than a hierarchical structure. Similarly, Seber and Kaya (2011a) looks at how decisions created at early childhood upbringing or in an educational setting may be corrected with an absolute-potential oriented performance measure use, rather than a relative-comparative downgrading performance measure. Also, Seber (2011d) looks at how information technology may be used in place of transportation in an educational setting for efficiency purposes and prevention of Global Warming. All these papers stress the mentioned paradigm shift as a result of which individuals, societies, and the world may benefit in the long-run.

Public choice literature is also important for our analysis for the use of tax payments in provision of public goods, which are nonrival and nonexclusionary by nature, entail free riding problem (that is people may want to benefit from public goods without paying for them); and on the spending side there is the principle-agent problem which means the government may use tax proceeds for partisan benefits rather than for the benefit of the society at large. We give Rowley and Schneider's work (2004) as a reference for issues related with public choice. Related with the paradigm shift we mentioned above, **the taxpaying corporations and the government officials may also accept the "maximizing the benefit of all" paradigm with possible welfare maximizing consequences for the citizens of a country**.

2. Model and Results for Revenue Maximization

The problem we intend to analyze for the paper is a simple question given in regular economics courses. It suffices for our purposes to analyze demand and supply as specific rather than general functions in order to illustrate different firm strategies and their consequences for the firm and the society. In solving this problem, we first want to find the solution of the equilibrium price and quantity and consider implementation of different alternative strategies for sharing of the excise tax payment afterwards:

Problem

Suppose demand and supply functions are given by the following linear equations:

$$Q_x^d = 7 - \frac{1}{2}P_x \tag{1a}$$

$$Q_x^s = \frac{1}{4}P_x - \frac{1}{2} \tag{1b}$$

Find the equilibrium price and quantity as well as the effect on these variables of a \$6 excise tax and the resulting total tax payment.

Answer

First, based on equations (1a) and (1b), we can find the inverse demand and supply functions where the dependent and independent variables are interchanged so that:

$$P_x = 14 - 2Q_x^d \tag{2a}$$

$$P_x = 2 + 4Q_x^s \tag{2b}$$

If we solve either equations (1a)-(1b) or (2a)-(2b), we find that equilibrium price, $P_x^e = \$10$, and equilibrium quantity $Q_x^e = 2$. This part of the problem has a straightforward solution with 2 equations and 2 unknowns.

2.1 Strategy 1 – When Tax is Considered as Bad to be Avoided

In order to analyze the effect of the excise tax on the price and quantity of x traded in the market, let's assume as in traditional analysis that all the payment of the excise tax is transferred to the consumers. Therefore, the new supply function will be:

$$P_x = 8 + 4Q_x^s \tag{2c}$$

The solution to equations (2a) and (2c) is the new equilibrium price of $P_x^e = \$12$, and equilibrium quantity $Q_x^e = 1$. In other words, the price of commodity x increases and quantity traded decreases. The total tax paid to the government will be $T = \$6 \times 1 = \$6$, and total revenue of the firm will be $TR = \$12 \times 1 = \$12$, with an after-tax revenue of \$6.

2.2 Strategy 2 – Neutralizing the Effect of the Tax Payment

It might also be possible for the firm to implement a strategy where it neutralizes the effect of applied excise tax. In this case the relevant demand and supply equations are equations (1a) and (1b) with the resulting equilibrium price and quantity as $P_x^e = \$10$, $Q_x^e = 2$. In this case total revenue for the firm is \$20 out of which \$12 is paid to the government as tax whereas the firm remains with after-tax revenues of \$8. This condition is best for the firm assuming a revenue maximization strategy. Both the consumers and the government are better off than strategy 1, nevertheless, worse off than strategy 3, as described below.

2.3 Strategy 3 – When Tax is Considered as Good to be Provided

On the other hand, let's assume that the firm wants to bear all the tax payment by itself and wants to maximize tax payments to the government (as a hypothetical example). In this case, instead of modeling the problem based on the inverse demand and supply functions, let's use the demand and supply functions as given in equations 1. The new supply function will be:

$$Q_x^s = \frac{1}{4}(P_x + 6) - \frac{1}{2} \tag{1c}$$

Solving equations (1a) and (1c), we find the new equilibrium price to be $P_x^e = \$8$, and equilibrium quantity to be $Q_x^e = 3$. When the firm considers it as good to pay taxes to the government, the resulting price is lower and quantity higher than that without paying taxes. The total tax payment and total revenue will be $T = \$6 \times 3 = \$18$, and $TR = \$8 \times 3 = \$24$, with an after-tax revenue of \$6 for the firm.

In this case, the firm operates by considering tax payments as a "good" to be provided rather than as a "bad" to be avoided. It gives \$18 to the government as taxes. Earnings of the firm are the same as its earnings of strategy 1 of \$6. In other words, it doesn't matter whether the firm considers tax payments as "good" or "bad" since its after-tax earnings are the same in both of the cases. Even though the firm is indifferent between the two states, both the government and the consumers are better off in strategy 3 compared to strategy 1. Put differently, strategy 3 Pareto dominates strategy 1, since at least one of the parties are better off without making anyone worse off. The situation can be better visualized in Figure 1.

An interesting feature of the analysis is the resulting price elasticity of demand for the two strategies. Let's define the price elasticity of demand as follows:

$$E_P^D = \frac{dQ}{dP} \times \frac{P}{Q} \tag{3}$$

Since the slope of the demand curve is -2, the price elasticity of demand is 6, 2.5, and 1.33 at the point of equilibrium for strategies 1, 2 and 3 respectively, all of which are greater than 1 and therefore in the elastic portion of the demand curve. In traditional microeconomic analysis, we know that when price elasticity of demand is greater than 1, increasing quantity (by means of decreasing price) increases total revenue.

The situation also holds in our example, where total revenue increases for the firm in strategy 3 compared to strategy 1. Consumers are better off in strategy 3 since they buy each quantity at a lower price of $8, rather than as in strategy 1 of $12. Producers are better off in strategy 3 since their total revenue is $24 rather than $12 as in strategy 1. The remaining amount of revenues to the firm after tax payments is unchanged, however, that is $6 in both of the strategies 1 and 3. Table 1 summarizes the returns analysis examined so far.

3. Results for Profit Maximization

We want to analyze the profit function of the firm in this section for different cost functions.

3.1 Assuming that the Firm has $MC = 0$

Given that the firm has MC = 0 (assuming that the supply function and marginal cost are unrelated), the revenue maximizing quantity choice would also represent the profit maximizing choice. In order to have a better grasp of the condition, it is possible to define the equations for total revenue, tax and profit as a function of quantity as follows:

$$TR = P.Q = 14Q - 2Q^2 \tag{4a}$$

$$MR = 14 - 4Q \tag{4b}$$

$$Tax = 6Q \tag{4c}$$

$$\pi = Q(8 - 2Q) \tag{4d}$$

The profit function (4d) may also be plotted as in Figure 2. As can be observed from Figure 2, regardless of the firm type, **strategy 2 of keeping the status quo after the announcement of the excise tax payment appears to be the best strategy for profit maximization. This is contrary to classical economic analysis, which recommends strategy 1 of tax avoidance as best strategy for dealing with an excise tax payment.**

Another interesting point in Figure 2 is that, normally we would expect the marginal revenue (MR) to become zero when Q equals 3.5, indicating that for the range of $Q\epsilon[0, 3.5]$, profits will be increasing. On the other hand, the introduction of the excise tax of $6, decreases this range to $Q\epsilon[0, 2]$.

3.2 Assuming that MC equals the Supply Function

In case the MC equals the supply function and with negligible fixed costs (such that $TC = 2Q + 2Q^2$ and $MC = 2 + 4Q$), the profit maximizing quantities and the resulting tax payments and profits are found as in Table 2 (in the calculations, tax payment is considered as cost, neutral and revenue, respectively, so that -6Q, 0, +6Q is added to the MC function and MR is equated to MC to find the profit maximizing quantity):

One interesting aspect of the analysis is **that in traditional economics, taxes are not considered at all in profit maximization decisions** (when equating MR to MC) even though they may have significance in the strategic decisions of the firm. The different strategies available for the firm as analyzed here, introduces a more correct view of approaching the problem in case of excise tax payments.

The results, which are summarized in Table 2, indicate that in a **static profit maximizing environment**, strategy 1 of cost avoidance appears to be the best strategy. In a **dynamic profit maximization environment**, however, where the demand function shifts to the right or left with entry and exit of firms and competitive price advantage, strategy 2 and 3 are equally viable strategies. In a dynamic environment, long-run profits of the firm would be zero, like in a heterogeneous product, many firm, monopolistically competitive market structure.

4. Analysis of the Results

There is a very important necessary condition, however, for the firm to retain any of the tax burden with the firm as in any of the alternative strategies proposed in the paper: **The necessary condition is that all the citizens of the country love, respect and trust each other.** Therefore, the owners of the firms should love their citizens (so much as to produce a commodity at a cheaper price and pay a lot of taxes which will be spent for the benefit of the citizens of the country). Also, the people forming the government, who are chosen by the citizens of the country, love their citizen (more than their own personal or partisan benefits), and will spend the tax proceeds (without any discrimination among the citizens) for the best alternatives for serving all the citizens of the country.

The simple example examined in this paper may also lead to the argument that, (without regard to the efficiency or technological domains) **public ownership of companies may be better for social welfare than private ownership in the case of distrust equilibrium,** and (without regard to the technological domain) **domestic private ownership may be better than foreign ownership of companies in the case of trust equilibrium**.

In any case, keeping the "status quo" after the application of the excise tax may be better for both types of private firms (domestic, foreign) if revenue maximization is the motive, contrary to the transfer of the excise tax to the consumer as in the case of the profit maximizing firm of traditional economic analysis. In more trustable environments, considering excise tax as "good" to be provided is a possible welfare improving strategy for both revenue maximizing and profit maximizing firms. Considering the excise tax payment as a "good" to be provided, rather than a "bad" to be avoided makes both the consumers and government better off as far as revenue maximization, and dynamic profit maximization is concerned, whereas the firm is indifferent between these two states. **This actually is the definition of a Pareto improving strategy.**

5. Conclusion

If individual - joint benefits of the firm, consumer and the government are assumed, different strategies may be considered as better strategies for different types of firms. For the revenue maximizing firm (which is also the profit maximizing firm when costs are negligible), the "status quo" is the best strategy, rather than assuming taxes to be as "good" to be provided or "bad" to be avoided. When costs are included, the result is that excise tax payment as "bad" is the best strategy for static profit maximization, whereas as "bad", "status quo", or "good" may all be equally viable strategies for dynamic profit maximization. For both revenue maximizing and dynamic profit maximizing firms, a more trustable environment makes excise tax payment as "good" to be provided strategy Pareto superior to excise tax payment as "bad" to be avoided strategy.

As far as the ownership of the firms is concerned, the analysis in this paper also indicates that having a more trustable environment favors "public" and "private domestic" firms in place of "private foreign" firms. Implementation of custom taxes on the import side of goods or provision of incentive mechanisms for the encouragement of domestic production and technological improvement may also be necessary needed supplementary measures in this regard. **These arguments are in conflict with the current trend of foreign ownership of companies, multinational corporations and free trade aspects of globalization**.

We may also state, for example, that the analysis carried out in the paper may have policy implications for the European sovereign debt problem, which may be considered as a result of the global financial crisis as stated in Arestis, Sobreira, and Oreiro (2011) and Posta and Talani (2011). The paradigm shift we proposed in the paper, a positive attitude of taxpayers for tax payments and a responsible government who deserves the trust of taxpayers may help to prevent a possible worst-case scenario of EU public finance and social problems.

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Table 1. TR of the Firm and Tax Payments

	(P; Q)	TR of the firm ($)	Tax payment ($)	After-tax revenue ($)
Strategy 1 **Tax Avoidance**	12; 1	12	6	6
Strategy 2 **Status Quo**	10; 2	20	12	8
Strategy 3 **Tax Provision**	8; 3	24	18	6

Table 2. Profit of the Firm with MR = MC Rule

	(P; Q)	TR of the firm ($)	TC of the firm ($)	Profit ($)	Tax payment ($)	After-tax profit ($)
Strategy 1 **Tax Avoidance**	12.5; 0.75	9.375	2.625	6.75	4.5	2.25
Strategy 2 **Status Quo**	11; 1.5	16.5	7.5	9	9	0
Strategy 3 **Tax Provision**	9.5; 2.25	21.375	14.625	6.75	13.5	-6.75

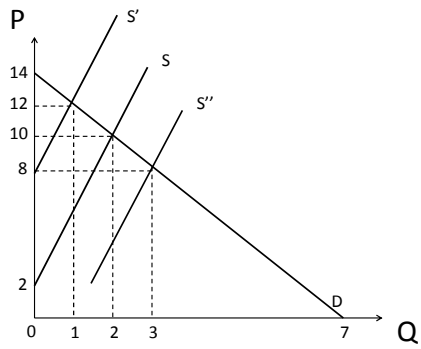

Figure 1. The demand and supply functions as given in equations 1 and 2. Line S is the initial supply function, S' the supply function when the firm considers the excise tax as "bad", and S'' the supply function when it considers the excise tax as "good".

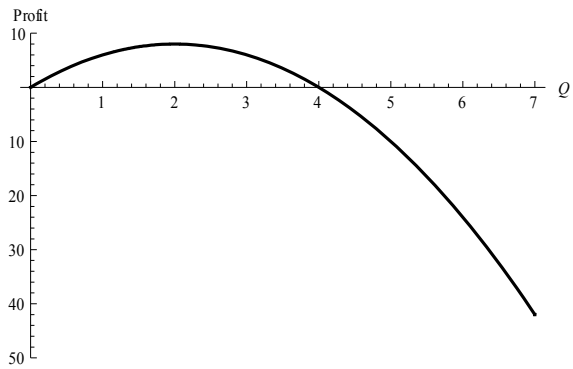

Figure 2. The profit function as a function of Q after tax payments when both fixed and variable costs are assumed to be zero.