

20 | COMPETITIVE MARKETS IN THE SHORT-RUN

Purpose: To illustrate price determination in the short-run in a competitive market, and to relate price determination to the choices made by competitive firms.

Computer file: **srmkt198.xls**

Instructions and background information:

You are a government economist studying the wine industry with an eye to commenting on some proposed policies that may affect the industry.

On the spreadsheet for this problem set the graph at the left shows the short-run average and marginal cost curves for a typical wine producing firm. The graph at the right shows the market supply and demand curves for wine when there are 500 firms in the industry, and consumer incomes are \$55,000 per family. Market price is \$40 per case. At this price the market is probably not in equilibrium, nor is the typical firm maximizing total profit.

The variables you can choose here are market price, the firm's output, income, a tax rate, and the number of firms. Excel automatically computes all the other values in the tables.

The wine industry is assumed to be perfectly competitive. The price of wine is determined in the market by supply and demand. In equilibrium excess demand for wine must be zero. Firms in the industry take the market price as a constant, and try to maximize profits by choosing an output level. In equilibrium for the firm, marginal revenue must equal marginal cost. Firms in the industry must adjust their outputs in response to changes in the market equilibrium price.

Your report about the wine industry must contain information about the industry's likely responses to changes in underlying economic conditions, as well as changes in government policies. To this end, you will conduct a series of hypothetical experiments using the model in this problem set.

You will first explore a change in income that affects the market demand for wine. Then you will explore the effects of government imposing a per unit tax on wine, including effects on price, quantity, profits, and social welfare measured by consumer and producer surplus.

Here are some things to watch for and learn as you do the problems:

- 1) Competitive markets adjust to equilibrium through changes in price. If a good is produced in perfect competition, it is supply and demand in the market that determine the price.
- 2) A competitive firm takes market price as given, and tries to maximize profit by choosing output so that marginal cost equals marginal revenue. Because price is constant for the typical competitive firm, marginal revenue and price (average revenue) are equal.
- 3) An increase in market demand raises equilibrium price, induces firms to sell more, and increases economic profit.
- 4) An increase in a per unit (excise) tax raises the market supply curve and firms' marginal and average cost curves by the amount of the tax per unit. The decrease in market supply raises price, but by less than the tax, and reduces quantity. Firms reduce output because marginal cost rises by more than price. Profits fall.
- 5) The excise tax causes a loss in total welfare as measured by consumer and producer surplus.

Here are some hints to help you get the answers more quickly:

- 1) Use Goal Seek to find the market equilibrium price. After you find the price, use Goal Seek again to find the firm's output that will make MR-MC equal to zero.
- 2) You'll need a calculator to figure out total profits. The quickest way to do that is to find the profit per unit ($P-AC$) and multiply by output.
- 3) To find the loss in welfare from the tax, sketch the supply and demand curves before and after the tax on a piece of scrap paper. Previously computed market quantities will give you the important information you'll need to find the deadweight loss.

MATH MAVEN'S CORNER: For this problem the market demand curve is given by $Q(D) = aI - b(P)$, where I is income, P is price, and a and b are randomly picked constants. The market supply curve is given by $Q(S) = N(P - t - d)/c$, where N is the number of firms in the industry, t is the tax per unit of output placed on all firms, and d and c are constants. The cost curves of the typical firm are $AC = d + (c/2)(q) + (FC/q) + t$, and $MC = d + c(q) + t$. FC is fixed cost.

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Questions

Set income, the tax, and the number of firms to their baseline values.

- 1) What's the market equilibrium price of wine?
- 2) What's the market equilibrium quantity of wine?

Set income, the tax, and the number of firms to their baseline values.

- 3) With the market in equilibrium, what output should the firm produce to maximize profit?
- 4) How much is maximum total profit?

With the tax still at zero, reduce income to \$45,000.

- 5) Is wine normal or inferior?

Continuing on from question 5,

- 6) What's the new market equilibrium price?
- 7) What's the new market equilibrium quantity?

With income still at \$45,000, and the market in equilibrium,

- 8) What output should the typical firm produce?
- 9) What are the maximum profits of the typical firm?

- 10A) Return all variables to their baseline values, and make sure the number of firms is 500. Make sure the market is in equilibrium, and that the typical firm is maximizing profit. Go on to question 10B).

The government imposes a tax of \$10 per case on all wine produced and sold.

- 10B) What's the new equilibrium market price of wine?

Continuing on from the last question,

- 11) What's the new equilibrium market quantity of wine?
- 12) For the \$10 tax on wine, how much did the price of wine rise?
- 13) At the new equilibrium price of wine, what is the profit maximizing output of the typical firm?
- 14) What are the firm's maximum profits after the tax?
- 15) For the \$10 tax on wine, how much total tax is paid by the typical firm?
- 16) What are the total tax collections of the government?
- 17) For the \$10 tax on wine, with the market and firm in the new equilibrium, what is the deadweight loss to society in consumer and producer surplus due to the tax?