

18 | COMPETITIVE MARKETS IN THE LONG-RUN

Purpose: To illustrate price determination in the long-run in a competitive market.

Computer file: **lrmkt1.xls**

Instructions and background information:

You are a consultant to the wine industry with the objective of assessing the future course of prices and profits in the face of a changing economic climate. The industry faces the prospect of some new taxes, and rather large changes in consumer incomes. Your job will be to advise the industry on what they might expect in the short-run and long-run if these changes actually happen. The wine industry is a constant cost industry. This means that as firms enter and leave the industry the prices of inputs are unchanged. This fact will make your investigations easier.

The wine industry is perfectly competitive, and the model you'll use to analyze change is in the computer file **lrmkt1.xls**. The graph at the left side of the screen shows the *long-run average cost curve* of a typical firm producing wine. Also included in the left-hand graph is the marginal cost curve that goes with the LRAC curve. The only difference from the problem sets on competitive markets in the short-run is that here the cost curve should be interpreted as a *long-run* average cost curve.

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 for wine is probably not in equilibrium, nor is the typical firm maximizing profit. The supply curve shown at the right should be interpreted as a short-run supply curve because as you move up it the number of firms is fixed. This problem set is mostly about long-run adjustments, however, so you will be able to change the number of firms in the industry to see what happens to market supply.

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

As an economist you know that entry of new firms will occur in response to the positive economic profits. You must predict the final level of equilibrium price, which you know must be at the bottom of the long-run average cost curve. Because LRAC and MC must be equal when LRAC is at its minimum point, you can use the Goal Seek facility in Excel to solve the problem. You want MC-AC to be zero by changing the firm's output. Once you do this, the long-run price must be at the level of AC.

Entry of new firms will make price approach its long-run equilibrium level. You need to find out how many firms will eventually enter the industry. To do this set price at its long-run equilibrium level. (See the hint below on how best to do this.) The market will be in equilibrium in the long-run only when enough firms have entered to make excess demand in the market equal to zero. You can solve the problem by trial and error, or use Goal Seek to get excess demand equal to zero by change the number of firms.

Of course, in the long-run profits for the typical winery, and for the industry will be zero. You will have to break this sad news to the Wine Marketing Board!

Separate analyses prepared by the economists predict that very soon family income will fall to \$45,000 per year. Starting from the long-run equilibrium you just found you're asked to predict the *short-run* effects of the decrease in income on the wine industry. Assume in this case that *short-run* means only that firms can't enter or leave the industry, but that firms can move along the marginal cost curve shown for the typical firm.

You're then asked to predict the new long-run equilibrium position of the firm and industry after the effects of the change in demand have occurred. In calculating this, remember that the long-run equilibrium price must leave the firm with zero profits.

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

- 1) If the typical firm in a competitive industry can earn positive economic profits, new firms will enter the industry.
- 2) In the long-run, entry and exit of firms assures that price settles down at the minimum point of the long-run average cost curve. In the long-run equilibrium the typical firm earns zero economic profit.

Here are some hints to help you get the answers quicker:

- 1) In some questions you're asked to find the level of long-run equilibrium price by finding minimum average cost. You then enter that level of price in the market data. To make your price entry as accurate as possible, try this: Select the cell that has the minimum value of AC. From the Edit menu, Copy the minimum value. Select the cell that has the value of price. Choose Paste Special from the Edit menu. Then, from the dialog box that appears select Values, and hit OK. This will keep as many digits as possible in the value for long-run equilibrium price.
- 2) You can use Goal Seek to find the number of firms in the long-run equilibrium. First set price to its long-run equilibrium level. (See hint 1.) Then use Goal Seek to make excess demand equal to zero by changing the number of firms.

- 3) Remember that in the long-run equilibrium the firm must still maximize profit by choosing $MR = MC$. But in the long-run the best the firm can do is earn a zero economic profit.

MATH MAVEN'S CORNER: The underlying equations here are the same as for the previous problem set. Here there is only a difference in interpretation: The cost curves are assumed to be long-run instead of short-run cost curves. Notice also that the industry is assumed to be a constant cost industry.

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Questions

Reset all variables to their baseline values. Record the SHORT-RUN EQUILIBRIUM values of the following variables:

- 1) Market price.
- 2) Market quantity.
- 3) Firm's quantity.
- 4) Firm's profits.
- 5) Industry profits.

Start from the equilibrium you found in questions 1) to 5). For long-run equilibrium price must be at minimum LRAC.

- 6) At what output for the firm is LRAC minimized?
- 7) What is the long-run equilibrium price?

In the long-run, entry and exit of firms is a crucial market price adjustment factor. Find the long-run equilibrium for the firm and industry. Then go on to question 8B.

Enter the long-run equilibrium values for the following variables:

- 8) Market quantity.
- 9) Market price
- 10) Number of firms.
- 11) Firm quantity.
- 12) Firm profits.

Economic studies predict a drop in income to \$45,000 per year. Starting from the long-run equilibrium you just found, what are the SHORT-RUN values of these variables?

- 13) New short-run equilibrium price.
- 14) New short-run equilibrium market quantity.

Continuing on from the last problem, what are the SHORT-RUN values of these variables?

- 15) New short-run equilibrium firm quantity.
- 16) New short-run equilibrium firm profits.

Now find the new LONG-RUN equilibrium for the wine industry, and for the typical firm.

Record the new long-run equilibrium values for these variables:

- 17) New long-run price.
- 18) New long-run market quantity.
- 19) Number of firms.

Continuing on from the last questions, record the new values of these variables:

20) New long-run equilibrium firm quantity.

21) New long-run equilibrium firm profits.