

ECON10004: INTRODUCTORY MICROECONOMICS

ASSIGNMENT 1: SEMESTER 2, 2026

Due: Thursday, September 24, 6pm

- Assignments must be submitted via the LMS subject webpage.
- Remember to keep a copy of your assignment.
- This assignment will account for 15% of your final grade.
- Maximum word limit: 1000 words (diagrams and equations do not count toward the word limit.)
- Points are awarded according to the quality of the answers. Most questions can be answered with just the final requested equation, a graph, or one to two sentences.
- Please type out all words in your assignment (illegible or hard to read work will not be marked). However, you may hand-draw diagrams and calculations, so long as they are attached in-line in your assignment (**not** separately at the end of the document) as a single presentable, easy-to-read PDF. We will deduct marks for poor presentation.
- As noted in your subject guide, you may use LLMs only to grammar-check your final answers and must cite the model used at the end of your assignment. Large negative penalties and potential referral for academic misconduct may occur if cheating is detected.

Over the last few years, Australian agricultural and luxury food exporters such as regional wineries have faced severe trade disruptions and unexpected international tariffs. Before trade barriers were imposed, many high-growth exporters undertook massive capital expansion projects, building automated packaging and processing plants to serve high-volume foreign markets. When foreign channels collapsed, these businesses were left operating high-capacity facilities strictly for domestic demand.

This problem set explores the relationship between production technology, cost curves, scale economies, and the decision to operate at a loss when trapped with high fixed overhead.

Part 1: Technology and Export Shock (80 points)

Consider a winery operating in regional Victoria. In the short run, the firm operates a fixed crushing and bottling facility. Output of wine bottles (q) depends on the number of skilled labour hours (L) according to the production function:

$$q = f(L) = 50\sqrt{L}$$

Question 1 (15 points):

1. **(5 points)** Derive the marginal product of labour (MP_L).
2. **(10 points)** Does this production function exhibit diminishing marginal returns to labour? Explain the physical intuition of your answer to this in a processing plant with a fixed physical layout.

Question 2 (20 points): The market wage for skilled facility workers is $w = \$40$ per labour hour. The monthly fixed cost of factory leasing and equipment maintenance is \$9,000.

1. **(5 points)** Invert the production function to express required labour hours, $L(q)$ as a function of output. Derive the total cost function, $TC(q)$.
2. **(5 points)** Derive expressions for marginal cost, average variable cost, and average total cost.
3. **(10 points)** Plot MP_L and marginal cost on separate diagrams. Explain the relationship between both curves.

Question 3 (20 points): To serve growing domestic and international export demand, the firm considers upgrading from its small facility to a high-capacity automated bottling facility.

The new automated facility increases fixed lease costs to $FC_L = \$25,000$ per month, but utilises advanced technology that changes the production function to $q = 100\sqrt{L}$.

1. **(5 points)** Derive the total cost function, $TC_L(q)$, and expressions for marginal cost, average variable cost, and average total cost for the automated facility (using $w = \$40$).
2. **(5 points)** Calculate the minimum efficient scale for both the small facility and the automated facility.
3. **(5 points)** At what output range is the small facility cost-superior? At what output range is the automated facility cost superior? (Note: The quantity where average costs of the two technologies cross will not be an integer. You will want to use the next-largest integer value to discuss the relevant ranges.)
4. **(5 points)** If fixed costs are irrecoverable, what is the minimum market price required for the firm to remain open and operate in the short run for the small facility and the automated facility? If the lease was contractually locked in for the next 12 months, describe what the term short run refers to in this context.

Question 4 (25 points): Due to rising trade barriers, foreign export channels collapse entirely. The firm now faces a domestic demand curve given by:

$$Q_D(P) = 75,000,000 - 2,500,000P,$$

where, as before, the quantity reflects the amount of wine demanded per month.

1. **(5 points)** Suppose there is free entry into the market and firms can freely switch to the small facility or the automated facility. What price would you predict in the long run? What technology are firms using?
2. **(10 points)** How many firms would you predict to exist in the long run? Does the loss of the export market cause firms to choose the smaller facility instead of the automated facility? Explain the intuition behind why this is (or is not) the case.
3. **(10 points)** How do you expect prices to change in the short run after the loss of the export market if fixed costs are irrecoverable? Assume that there were originally 20,000 firms with the automated facility operating at the minimum efficient scale. Outline how production and the market changes (i) immediately before firms adjust

their production, (ii) in the short-run equilibrium, (iii) in transition between the short-run equilibrium and the long-run equilibrium and (iv) in the long-run equilibrium. In describing how the industry transitions between the short-run equilibrium and the long-run equilibrium, you may assume that all firms use 12-month contracts for non-labour related inputs but that they differ in the amount of time remaining on their contract for these inputs. (Note: you should give exact price and per-firm quantities for (i), (ii), and (iv). However, for part (iii), you do not need to numerically describe how prices evolve and only need to describe the process.)

Part 2: Open Analysis (20 points)

Attached alongside this problem set are two articles related to the wine industry. After reading them, pick **one** of the two topics and write a short analysis based on your understanding of costs.

Aim to write 2-3 paragraphs with a graph for support.

Option 1: In its 2026-27 Pre Budget Submission, industry body Australian Grape & Wine (AGW) called for federal structural adjustment funding to assist grape growers and winemakers to exit or downscale unviable operations. Contrast the economic effect of a traditional per-unit production subsidy against a transition grant, which compensates firms to exit the market. Explain which of the two proposals better addresses the underlying long-run issue in the market.

Option 2: Recent financial reporting in the Australian Financial Review highlights major producers such as Treasury Wine Estates and Endeavour Group tapping advisory firms to offload vineyards and processing facilities amid domestic oversupply. Suppose a large agricultural conglomerate offers to buy out your business at the height of the capacity glut as in Part 1 (Question 4.3). Make a reasonable assumption about how long your plant lease is contractually locked in and pre-paid for. Explain the minimum purchase price your firm would accept at this point. Clearly explain how your minimum valuation depends on the remaining pre-paid lease horizon.

Your total score for this problem will relate to the quality of your answer. As a broad rubric, we will reward points based on the following:

- **Identified relevant economic ideas (5 points):** The student has identified the economically relevant parts of their chosen option and have based their analysis on these parts of the discussion.
- **Coherent application of economics (10 points):** The student has coherently applied ideas from lectures 12-15 to their chosen problem to answer their question. Unnecessarily lengthy text that does not get to the point will be especially penalised (warning: AI tends to produce text like this!)
- **Use of diagrams (5 points):** The student has provided a supplementary graph or figure that helps support their analysis.