Question 1

Supply in a market is $Q_s = 5$, and demand $Q_d = 10 - p$.

Question 1a

Which of the following is true in a competitive equilibrium?

- **Answer:** The equilibrium price is 5.
    - **Explanation:** The supply is fully inelastic, hence the quantity in equilibrium will be determined by the supply side of the market. So $Q = 5$ in a competitive equilibrium. We can substitute in the demand to get the equilibrium price $P = 5$. Consumer surplus is then $(10 - 5) \times 5/2 = 12.5$, and the producer surplus is $5 \times 5 = 25$.

Question 1b

The government imposes a per-unit tax of 0.5 on buyers. Which of the following is true?

- **Answer:** Producers bear all the burden of the tax.
    - **Explanation:** The burden of the tax falls entirely on producers since the supply is inelastic.

Question 1c

Instead of taxing buyers, the government now imposes a per-unit tax of 0.5 on producers. Which of the following is true?

- **Answer:** The imposition of the tax does not change the quantity sold in this market.
    - **Explanation:** Since supply was already inelastic, the quantity does not change. The equilibrium is still $Q = 5$ and $P = 5$. The producers bear all the burden of the tax.

There is no practical difference between imposing a per-unit tax on producers or consumers in a market. The economic incidence, or burden, of the tax will be the same regardless of who pays it nominally. When a per-unit tax is introduced, it creates a wedge between the price consumers pay and the price producers receive. The tax burden falls on both consumers and producers, with the side that is more price inelastic bearing a larger share.

For example, if demand is more inelastic than supply, consumers will pay a higher price and bear most of the tax burden. If supply is more inelastic, producers will receive a lower price and bear the majority of the tax incidence. However, the equilibrium quantity transacted and the total tax revenue collected will be the same regardless of whether the tax is imposed on consumers or producers. The statutory incidence, or who nominally pays the tax, does not affect the economic incidence or the deadweight loss of the tax.

Question 4

Suppose that the market for Pink Lady apples has 10 farms, each with a supply curve given by $Q_s = 6$, and 10 consumers, each with an individual demand curve given by $Q_d = 10 - p$. Note that the marginal cost for producing an additional apple for each farm is zero as long as they are producing fewer than 6 apples and is $£200$ for any apple above 6. (Simple explanation for this: each farmer owns one tree, producing 6 apples; to produce more they need to buy a new tree from Australia, and pay the shipping costs, etc.)

A) What is the aggregate demand curve in this market?

B) What is the aggregate supply in this market?

C) Compute the perfectly competitive equilibrium price and quantity in this market. What is the profit of each farm? What is the total profit of all farms together?

Suppose now that all the farms get together and decide to act as one big monopoly.

D) How many apples will this new monopoly produce? What is the monopoly's profit? Is the monopoly better off than when they were operating as 10 independent farms (assume that they divide the profits equally within the monopoly)?

E) Should the government allow the farms to get together as a monopoly? In your answer refer to total surplus and to the distributional effects of the different outcomes, as well as to the meaning 'should' could take.

Part A: Aggregate Demand Curve

- **Individual Demand Curve for Each Consumer:** $Q_d = 10 - p$
- There are 10 consumers, so the **aggregate demand** is:
  $Q_d^{\text{total}} = 10 \times (10 - p) = 100 - 10p$

Part B: Aggregate Supply Curve

- **Individual Supply Curve for Each Farm:** $Q_s = 6$ (since the marginal cost is zero up to 6 apples, the supply is perfectly inelastic up to this point).
- There are 10 farms, so the **aggregate supply** is:
  $Q_s^{\text{total}} = 10 \times 6 = 60$

  The supply is perfectly elastic at 60 apples with a cost of $£200$ per apple beyond that.

Part C: Competitive Equilibrium

- **Equilibrium Condition:** $Q_d^{\text{total}} = Q_s^{\text{total}}$
- $100 - 10p = 60 \quad \Rightarrow \quad 10p = 40 \quad \Rightarrow \quad p = 4$
- The Equilibrium is the intersection $60 \text{ apples} \times £4 = £240$ in revenue, and given marginal cost for apples produced with existing trees is $£0$, all revenue can be recognised as gross profit.
- Profit for each farm would be $£240/10 \text{ farms} = £24$.

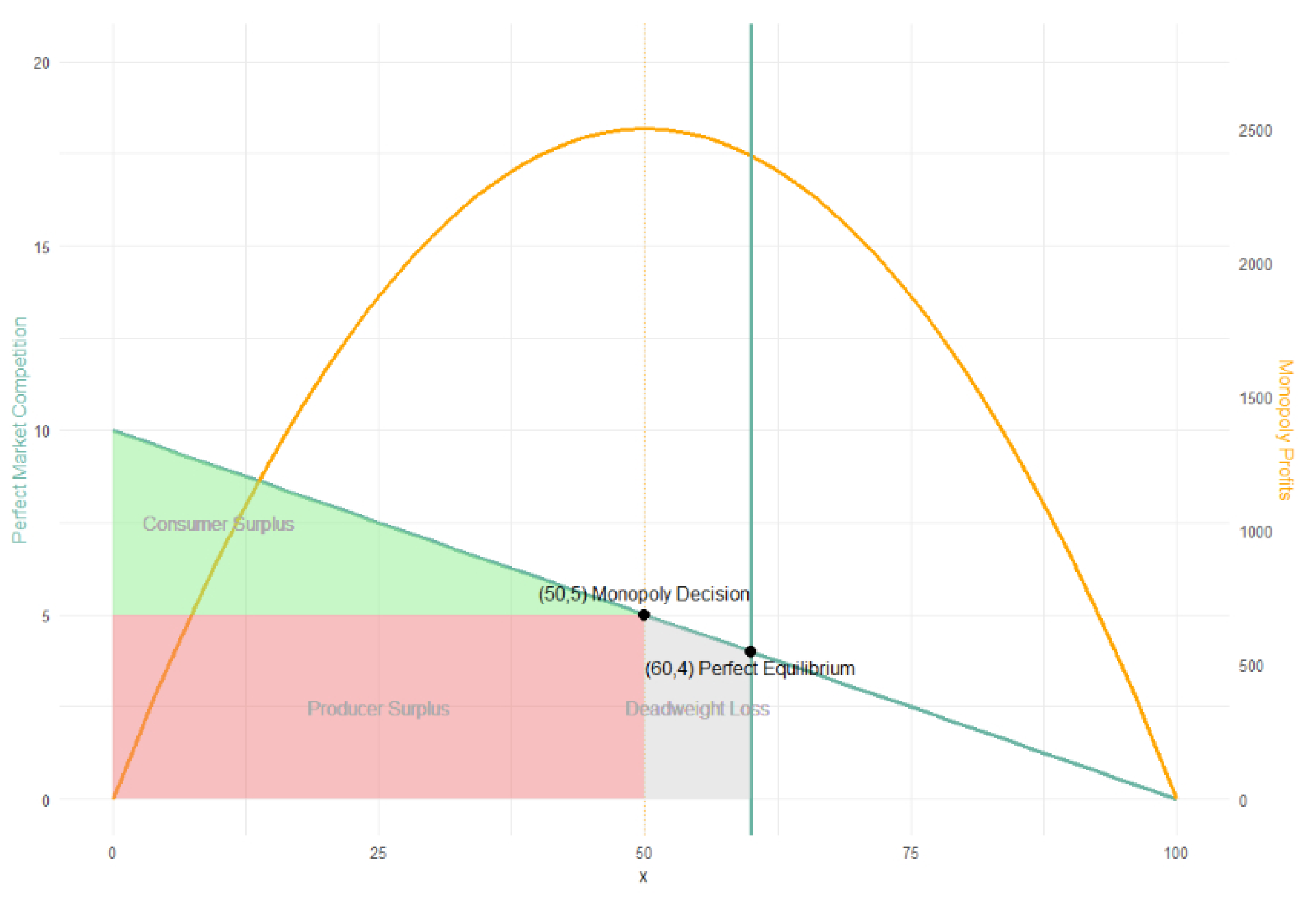
Part D: Monopoly Scenario

- **New Aggregate Supply Curve:** The monopoly faces the same marginal cost structure but for aggregate output.
- In this case, the monopoly would set a price to maximise profits.
- **Profits** $= Q_d \times p = 100p - 10p^2$
  Which is optimised at $Q_d' = 100 - 20p = 0$
  so the monopoly would set the price to $£5$, sell 50 apples, and recognise $£2500$ in profit total, or $£250$ in profit each farm, which is a 4.16% improvement.

Part E: Government Perspective on Allowing the Monopoly

While the monopoly increases the producer surplus slightly, the total surplus decreased due to reduced consumer surplus. This may be shown graphically, whereby the reduced consumer surplus is greater than the gained producer surplus, due to the addition of deadweight loss.

Distributional Effects: Consumers are worse off under the monopoly due to higher prices and reduced consumer surplus. Producers are better off individually, but the marginal gain is small compared to the loss in consumer surplus.



There are various incentives motivating government decision making.

- From an *Economic Efficiency* perspective, the government should disband the monopoly to increase total surplus and overall welfare.
- *Equity Considerations* should motivate the government to disband the monopoly.
- *Political Context*: Farmers may get upset over a reduction in profits, whilst the consumers may be indifferent to a reduction in the price of Pink Lady apples leading to a net loss of political support.
- The government may support a monopoly if it aligns with broader goals, such as food security or rural development, despite potential inefficiencies.
- Whether the government *"should"* take action against the formation of a monopoly may also be considered against existing legal frameworks. However, there may be scope for these legal frameworks to change.

Question 6

Suppose all firms in a perfectly competitive market are initially in both short-run and long-run equilibrium. Then a lump-sum tax (i.e. a tax that is unrelated to a firm's output) is introduced.

A) Draw a diagram to illustrate the effects of the lump-sum tax on an individual firm and the whole industry.

B) What impact will this have on each firm in the short-run?

C) What impact will this have on market price in the long-run?

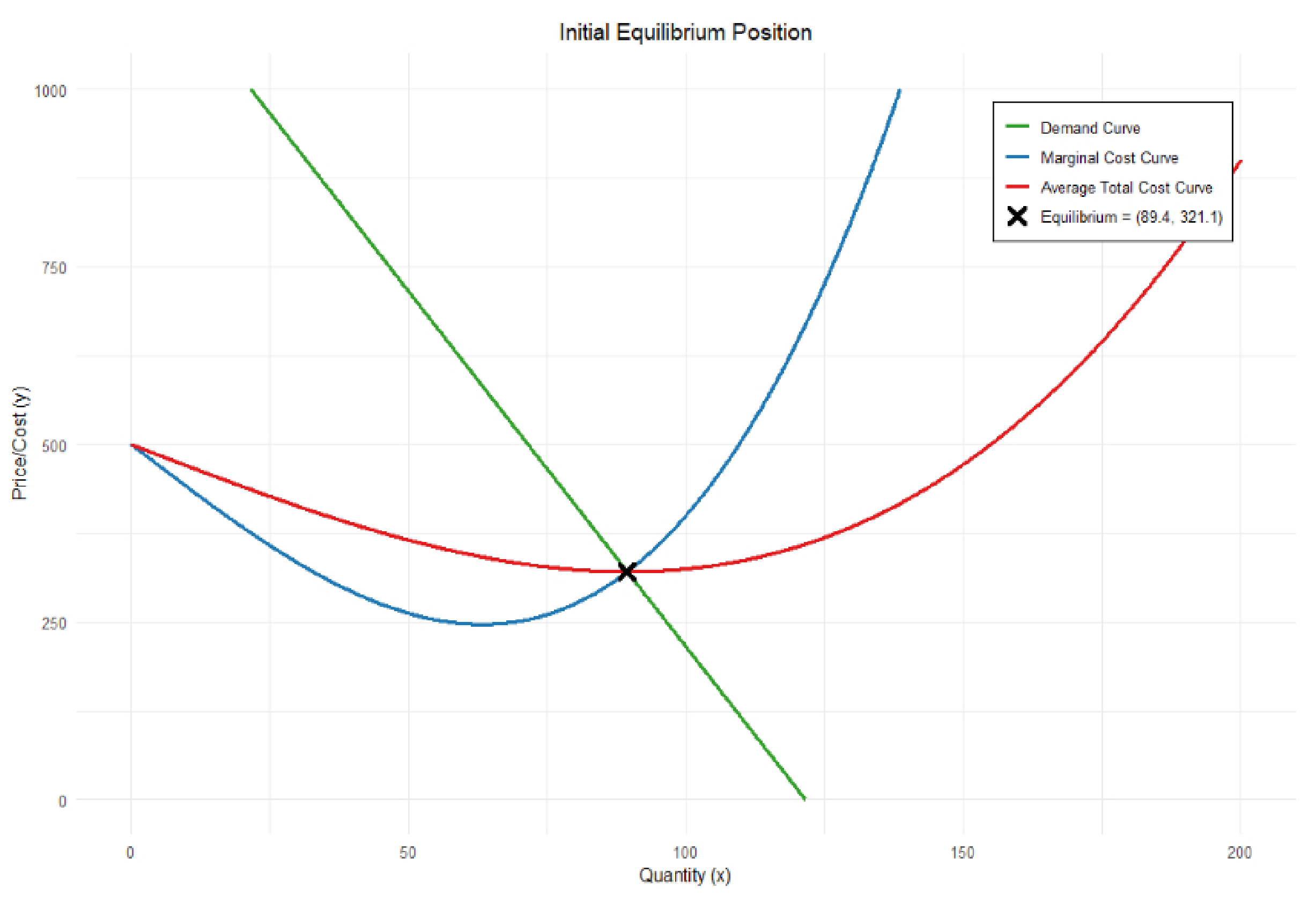
D) What impact will this have on each firm's output in the long-run?

E) What impact will this have on the number of firms in the industry in the long-run?

In the initial state, the market, under perfect competition, was in both short-run and long-run equilibrium. This implies that several firms supplied the market with identical goods at identical cost and selling prices.

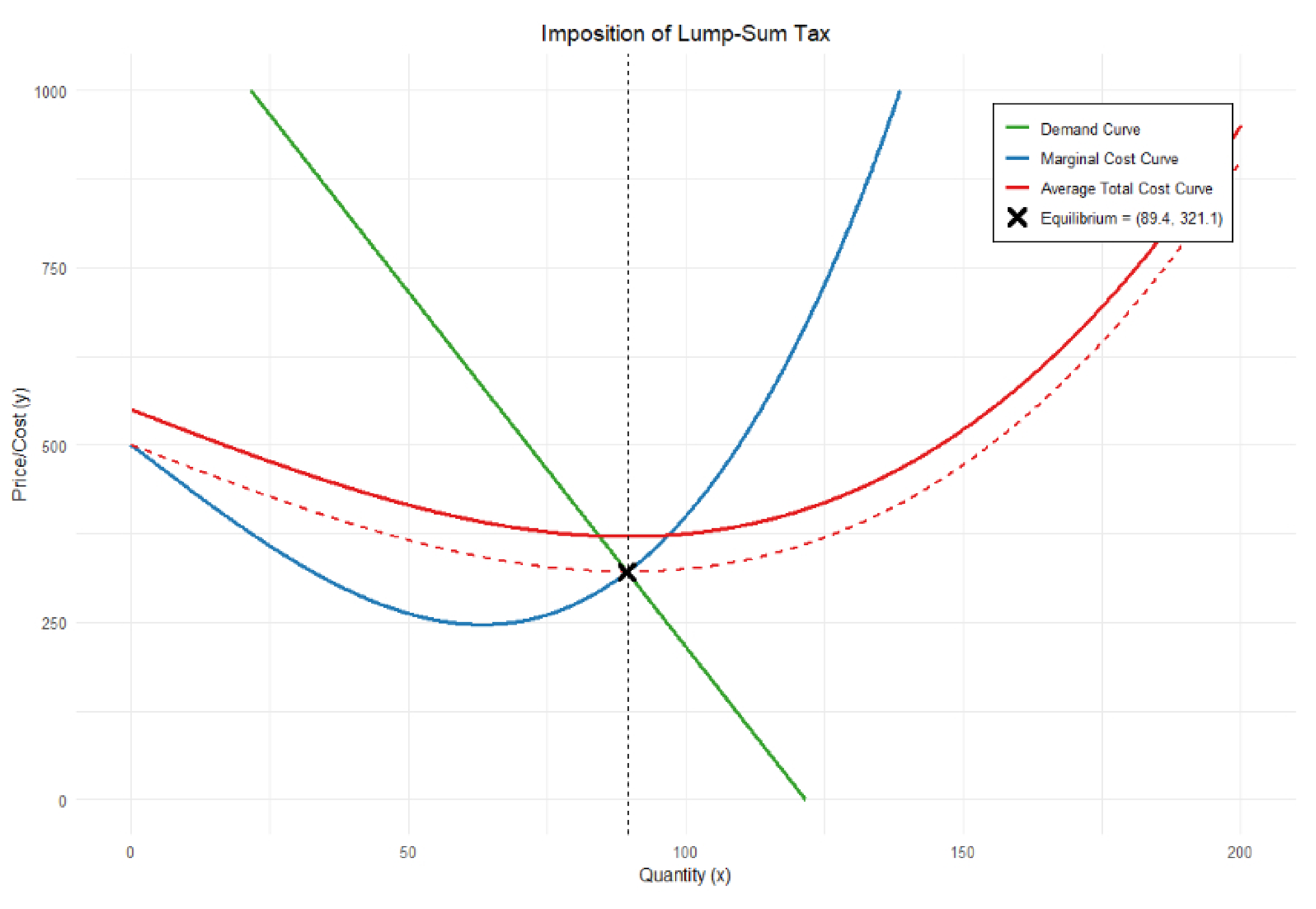
In this scenario, sufficient firms operated in the market such that;
$\text{Price} = \text{Marginal Cost} = \text{Minimum Average Total Cost}.$
The market was perfectly optimised to maximise total surplus, minimising costs and maximising quantity. The firms made zero economic profit.

> **The industry wide supply curve is the horizontal summation of all the individual firm's supply curves.**
>
> **For firms, the Marginal Cost Curve is the Supply Curve.**



The Marginal Cost Curve intersects the Average Total Cost Curve at its minimum point. This is intuitive since any unit produced above the average cost contributes to increasing it. Since the market is optimised, this also happens to be the intersection point of the demand curve.

A Lump-Sum Tax is a fixed tax that does not depend on the level of output produced by the firm. As such, the lump-sum tax contributes to increasing the average total cost curve but has no impact to the marginal cost curve.



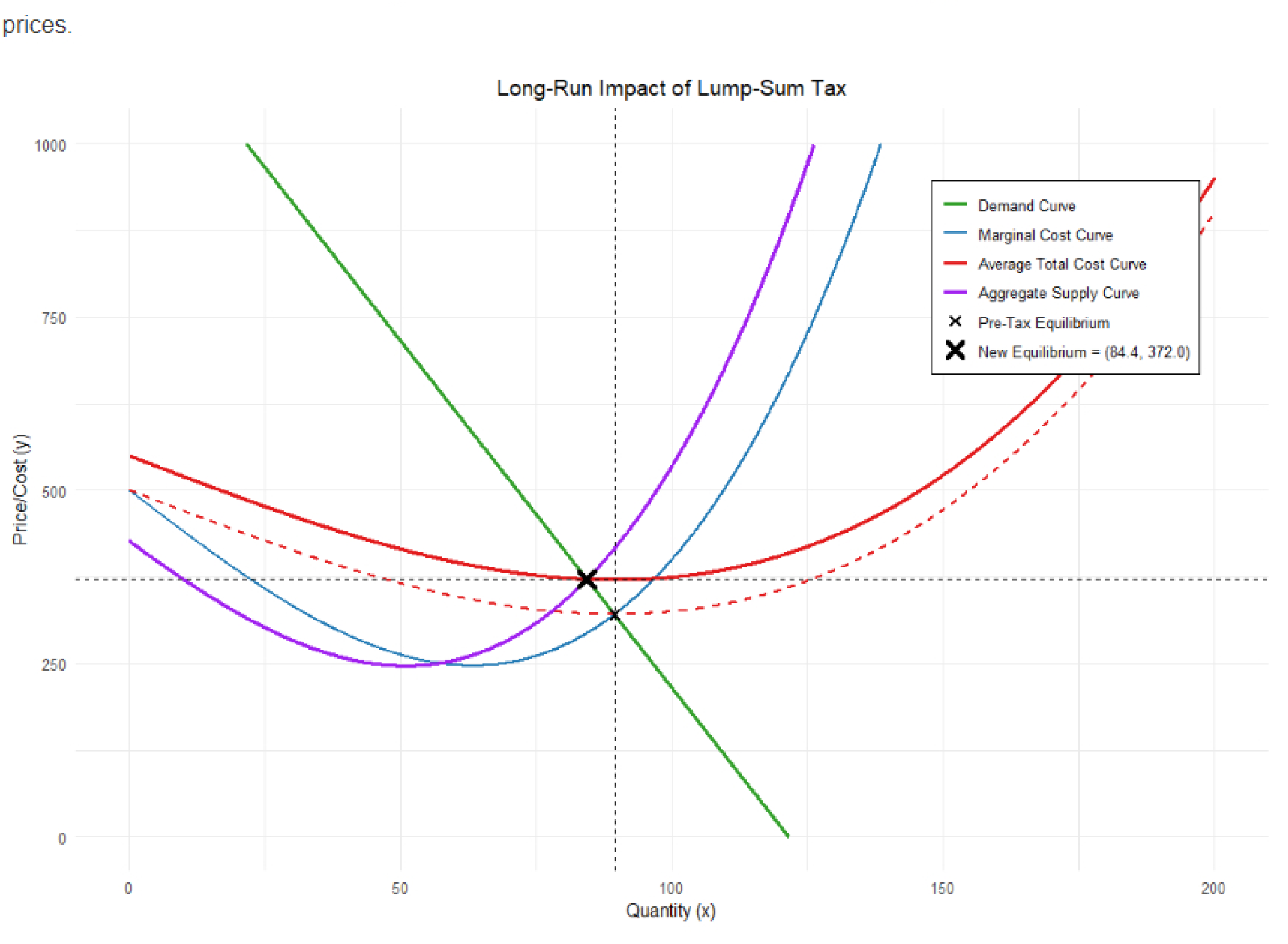
In the short-run, firms will keep on producing the same quantity of goods, and sell them at the same price. For the firms, selling at the intersection between demand and marginal cost will always maximise their profits / minimise their losses.

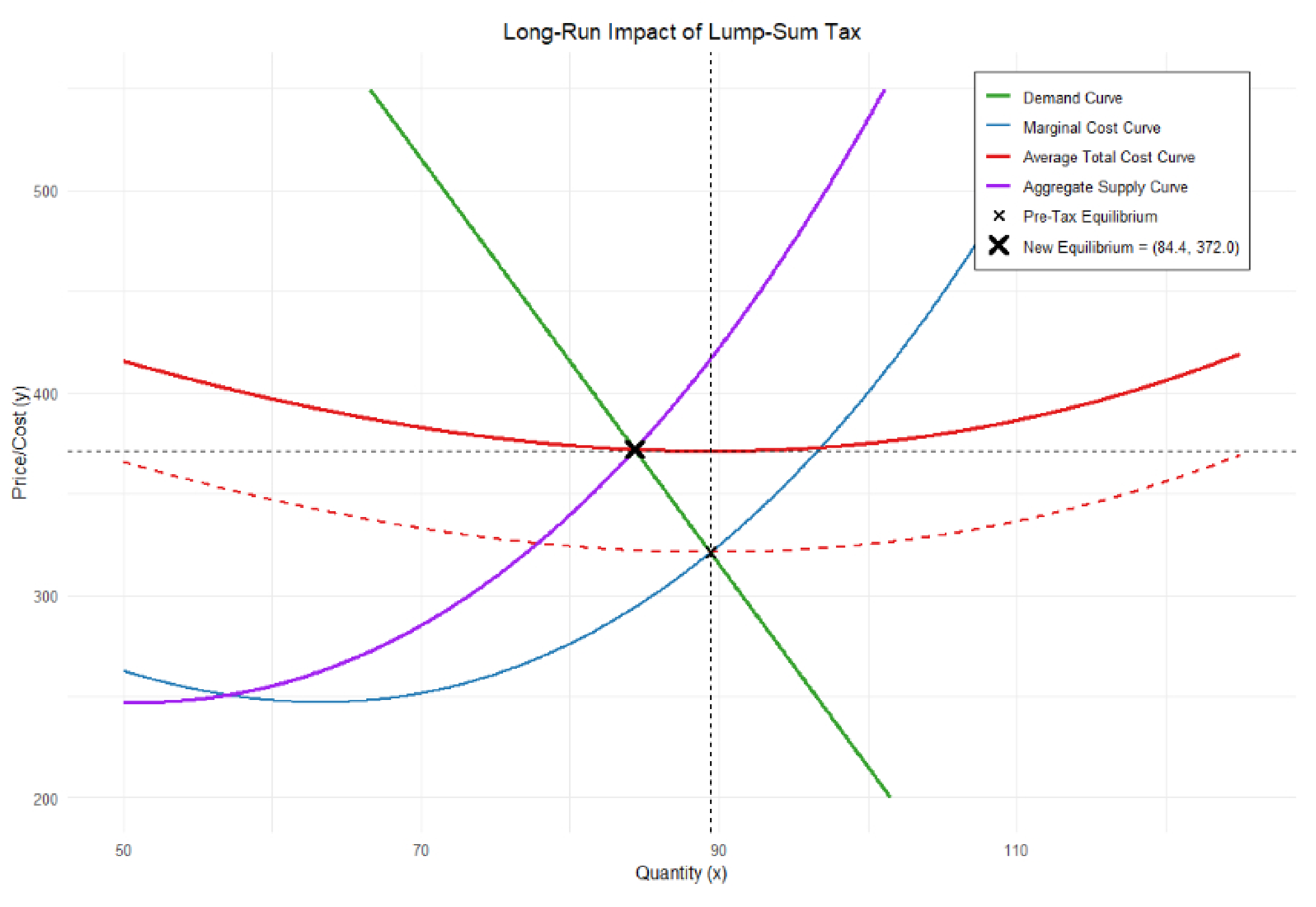
They will absorb the full impact of the tax, thus turning their break-even position to a loss.

Due to the new situation in the market, it will no longer be feasible for all firms to remain in the market. Firms that cannot cover their costs will exit the industry, relieving themselves of the tax burden and the economic losses.

The adjustment occurs through the exit of firms rather than changes in individual firm output.

In a perfectly competitive market, when firms exit the industry, the overall supply curve shifts to the left. This is because the exit of firms reduces the sum of goods available in the market. The reduction in supply leads to increases in market prices.





For the firms that remain in business, their output and costs are constant throught the market rebalancing but the increasing selling price allows them to reduce their losses. The market price will continue to increase until the remaining firms in the industry are able to cover their new average total costs, including the lump-sum tax, and return to zero economic profit.

The new equilibrium position has consumers buying less goods at a more expensive price reducing total surplus.