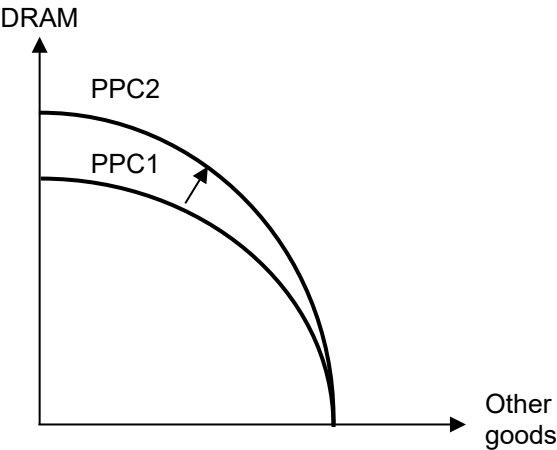
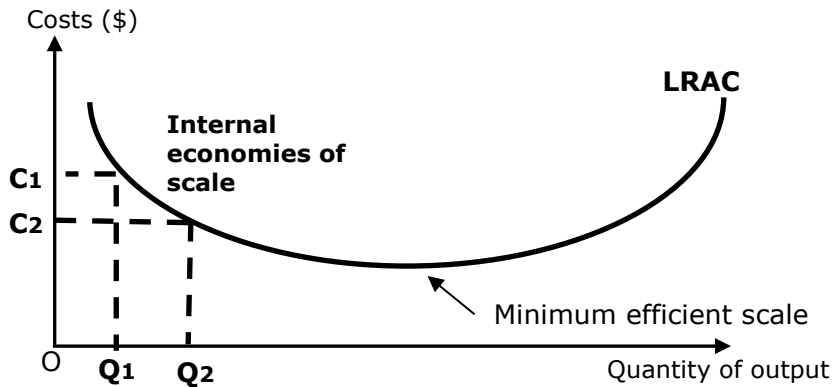


2025 Y5 TP Suggested Answers and Mark Scheme

(a)		With reference to Table 1, compare the trends in revenue for the three largest DRAM manufacturers between 2nd and 4th Quarter 2016.	[2]
		Similarity: Revenues increased for the three largest DRAM manufacturers. (1m) Difference: Between 2nd and 4th Quarter 2016, Micron's revenue increased by the largest extent (40%), followed by SK Hynix (38%) and then Samsung (37%). (1m) <u>Examiners' Comments:</u> Most candidates were able to identify the general increase in revenue for the 3 firms. However, an alarming number of students compared absolute changes, instead of percentage change.	
(b)	(i)	Define Production Possibility Curve (PPC).	[1]
		A PPC shows all the maximum attainable combinations of two goods that a country can produce within a specified time period with all its resources fully and efficiently employed, at a given state of technology. (1m) <u>Examiners' Comments:</u> Only a handful of candidates were able to provide the full definition, with many missing the point on resource utilisation and/or the state of technology. Some candidates stated that the PPC shows combinations of output which are productively efficient. While this is true, such answers have not defined PPC in a self-contained manner without relying on another undefined term.	
	(ii)	With the aid of a PPC diagram, explain how an increase in productivity in the DRAM industry might affect the maximum possible output in an economy.	[3]
		• Increase in productivity in the DRAM industry implies an improvement in quality of resources (e.g. labour or capital). This means that with the same quantity of resources, there will be a greater output of DRAM. (1m) • The increase in productivity is represented by a skewed outward shift of the PPC, from PPC1 to PPC2, in favour of the production of DRAM, while other goods will see no or a smaller increase in potential output. (1m) • <i>Accurate and well-labelled diagram</i> (1m)  <u>Examiners' Comments:</u> A number of scripts conflated an increase in the maximum output (shift of the entire PPC) with an increase in output (from a point inside the PPC to a point of the PPC).	

		<i>A few scripts mentioned an outward shift of the PPC but did not explain why the maximum output for either or both goods would increase.</i>	
(c)	(i)	With reference to the case material, explain what is meant by: fixed cost	[2]
		Fixed cost is cost that does not vary with output levels. It is a cost that must be paid even when production does not take place. (1m) An example of a fixed cost incurred within the DRAM industry is the: - start-up cost incurred from the purchase of equipment for DRAM production plants (Extract 2, para 2). The cost of acquiring equipment do not vary with output level and must be paid even if production does not take place. (1m) OR - costs incurred from Research and Development (Extract 2, para 2). R&D costs do not vary with output level and if the firm engaged in R&D, it must be paid even if production does not take place. (1m) <u>Examiners' Comments:</u> A number of candidates provided theoretical examples of fixed costs and made little to no reference to case material.	
	(ii)	variable cost	[2]
		- Variable cost is cost that varies directly with output level. It is not incurred if production does not take place. [1m] - One example of variable cost is the cost of acquiring raw materials like silicon (Extract 2, para 3). As the firm produces more output, more silicon is needed. Cost of raw materials will not be incurred if there is no production. [1m] <u>Examiners' Comments:</u> A number of candidates mistakenly explain R&D as a form of variable cost, thinking that since some firms choose to engage in R&D and some do not, R&D costs can be varied. This shows a conceptual misunderstanding that discretionary costs are variable costs, which is incorrect.	
(d)	(i)	Using Figure 1, identify and explain the likely market structure associated with the DRAM manufacturing industry.	[2]
		- Oligopoly [1m] - With reference to Figure 1, the market concentration ratio of the top 3 firms (Samsung, SK Hynix and Micron Group) is 93%, reflecting the dominance of a few large firms in the industry [1m] <u>Examiners' Comments:</u> Majority of students recognize that the market is an oligopoly. However, there were many who did not use the 3-firm concentration ratio to support their answer.	
	(ii)	Extract 3 mentions that “companies entering the DRAM market will face entry barriers”. Explain one such artificial barriers to entry.	[2]
		- Extract 3, para 2 mentions that the three incumbents are “unlikely to share their technologies and research”. This implies a certain degree of statutory barriers to entry in the form of patents on specific aspects of their DRAM designs, manufacturing processes, and memory management techniques. The patents prevent other firms from copying their design and eroding their market share. OR - Extract 4, para 1 suggests that Samsung may be engaging in predatory pricing when it flooded the market with cheap DRAM memory chips, causing smaller	

		firms like Micron to make losses. The low prices set by incumbents serve as a strategic barrier to entry by making it unprofitable for potential new entrants who typically operate on a smaller scale of production and thus have a higher unit cost of production. <u>Examiners' Comments:</u> <i>Some candidates mistakenly argue along the lines of natural barriers to entry due to the high start up cost required. This clearly missed the mark of artificial BTE. Other candidates, while correctly identifying R&D as a form of artificial BTE, the elaboration as to why it reduces ability of new firms to enter the market was poorly done.</i>	
(e)		Discuss the view that in the DRAM industry, large firms will always enjoy cost advantages.	[10]
		<u>Approach:</u> • <i>T-AT-Synthesis</i> • <i>Thesis: Large firms are able to reap iEOS</i> • <i>Anti-thesis: Large firms may suffer disEOS once it produces beyond its MES</i> • <i>Synthesis: In the context of the DRAM industry, are firms more likely to be operating below or beyond MES? What happens when ceteris paribus assumption is relaxed e.g. change in level of technology?</i> <u>Intro</u> • Large firms in the DRAM industry such as Samsung, SK Hynix and Micron generally enjoy cost advantages from their larger scale of production. <u>Body</u> Thesis: Large firms in the DRAM industry enjoy internal economies of scale (iEOS) As large DRAM firms expand their scale of production, unit cost falls as firms reap iEOS. • Large firms are able to enjoy technical iEOS from the specialization and division of labour. As mentioned in Extract 2, para 3, large plants in the DRAM industry use "specialized assembly processes to divide tasks across thousands of chips". Workers can be tasked to do specific, simpler and more repetitive jobs. With this specialisation and division of workers, workers become more efficient in their job, and less time is lost to task-switching from one operation to another. As workers get better at performing each of these tasks, productivity improves and output per unit input increases. Assuming input costs remain constant, average costs falls as scale of production increases. <u>OR</u> • Large firms can also reap marketing iEOS. As mentioned in Extract 2, para 3, large DRAM firms enjoy cost advantages in the procurement of raw materials such as silicon from key suppliers. Large firms have bargaining advantages and are accorded with preferential treatment by their suppliers in the purchase of raw materials such as silicon because they are able to buy these raw materials in bulk (large scale). This enables them to negotiate and obtain discounts on procurement of raw materials, hence lowering average costs. As firms expand their scale of production from Q1 to Q2, firms enjoy cost savings as shown by a downward movement along the LRAC curve and average cost falls from C1 to C2.	



Anti-thesis: Large firms in the DRAM industry may cease to enjoy cost advantages when they expand beyond their minimum efficient scale (MES) and internal Dis-Economies of Scale (DisEOS) starts setting in.

- Large firms may incur **high cost of monitoring and management**. As mentioned in extract 3, para 2, DRAM suppliers continue to expand production with increasingly large and complex DRAM manufacturing facilities. Monitoring the productivity and the quality of output from thousands of employees in big, complex corporations like Samsung and Micron is imperfect and expensive – this links to the concept of the principal-agent problem i.e. the difficulties of shareholders monitoring the performances of managers.

OR

- Larger firms often suffer from **communication and coordination issues** as they find it difficult to maintain an effective flow of information between departments, divisions or between the head office and its subsidiaries. Additionally, time lags in the flow of information can also create problems in terms of the speed of response to changing market conditions and thus may incur more costs to make the change.

Conclusion/Evaluation

In conclusion, large firms may not always enjoy cost advantages as it may be operating beyond its minimum efficient scale (MES).

Generally, large firms in the DRAM industry are **highly likely to enjoy significant internal economies of scale due to the highly capital-intensive nature of DRAM manufacturing**. The DRAM industry is extremely capital-intensive, with high fixed costs in R&D, setting up the fabrication plants, and acquiring precision equipment. Large firms like Samsung and Micron can spread these fixed costs over large quantities, thus lowering the average cost. In contrast, smaller firms will struggle to match the investment needed to remain competitive, making cost advantages from scale for large firms very likely and persistent in this context.

Nonetheless, with changes in technology or new ways of doing businesses, **cost advantages from scale may be eroded and become less certain over time**. For example, smaller chip manufacturers may look to outsource production, thus lowering the barriers of entry and increase the level of competition in the DRAM manufacturing industry.

Mark Scheme		
<i>Knowledge, Application, Understanding, Analysis</i>		
L2	- A well-elaborated and balanced answer that considers both cost advantages and disadvantages - Good use of case material - Clear explanation of different types of iEOS within the context of the DRAM Industry	4-7
L1	- Answer is irrelevant and contains little economic analysis - Contains glaring conceptual errors - No reference to case material	1-3
<i>Evaluation</i>		
E2	<i>Reasoned judgement on whether large firms will always enjoy cost advantages, contextualised to the DRAM industry</i>	2-3
E1	Judgement lacks explanation and/or contextualisation	1
<u>Examiners' Comments:</u> <i>A number of scripts listed theoretical sources of iEOS. Where possible, students should elaborate on sources of iEOS that are mentioned in the case extracts.</i> <i>A number of scripts misinterpreted cost advantages as a form of pricing strategy.</i> <i>Many candidates argued extensively about cost advantages faced by small firms – which is not the focus of the question.</i>		

Essay Question

As Millennials and Gen X start entering the workforce and move up the corporate ladder, they begin to be attracted to plant-based meat derived from plant proteins like soybeans. The costs of sourcing and processing plant proteins are also on the rise. These developments have led to a boom in sales revenue in this industry.

Source: CNBC, 25 Aug 2021

- (a) Explain the boom in sales revenue in the market for plant-based meat. [10]
- (b) Discuss how changes in the plant-based meat market affect consumers and producers in its related markets. [15]

(a)

Introduction

- Clarify boom in sales revenue as rise in total revenue (TR) and $TR = \text{price} \times \text{quantity}$
- Changes in demand and supply caused by the different developments in the plant-based meat market affect the total revenue
- Define demand and supply

Body

Requirement #1: Demand factor explains boom in sales revenue

Rising demand for plant-based meat from Millennials and Gen Z due to:

- **Income:** As Millennials and Gen Z enter the workforce and climb the corporate ladder, they will see rising income which increases their purchasing power. Income elasticity of demand is defined as the responsiveness of quantity demand of a good to a change in consumers' income, ceteris paribus. Plant-based meat may be perceived as a luxurious good, especially those marketed to the gourmet market due to its limited availability, and the perception of premium quality – thus, $YED > 1$. A rise

in income leads to a more than proportionate rise in demand - resulting in a large rightward shift in demand curve to D_1 .

- Taste and preferences for plant-based meat with rising concerns about environmental sustainability; production of plant-based meat is believed to release lower carbon emissions than animal agriculture. Rising health concerns of higher risk of cardiovascular diseases from meat consumption also increased taste and preferences towards plant-based meat, further supporting the shift in demand curve to D_1 .

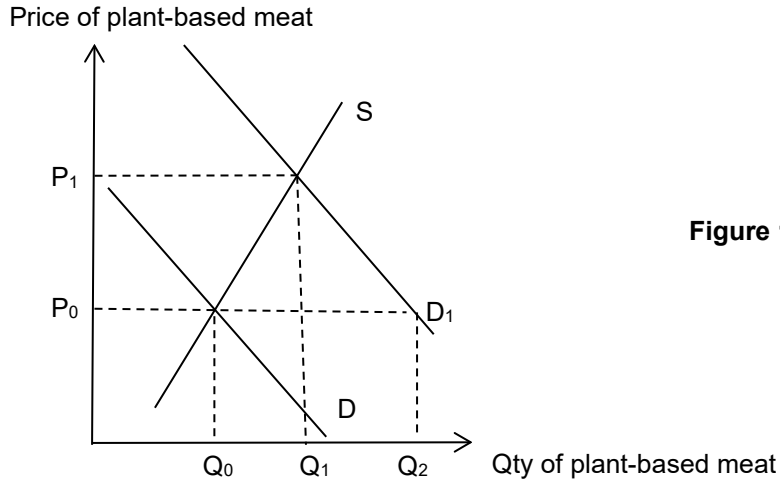


Figure 1

Market Adjustment Process:

At the initial price, P_0 , the rise in demand leads to a shortage $Q_2 - Q_0$, this puts upwards pressure on prices as consumers compete with one another for limited supplies. As prices start to rise, consumers of plant-based meat reduce quantity demanded due to the income and substitution effect. Similarly, when prices increase, producers of plant-based meat increase quantity supplied due to greater profit incentives from the higher prices. This occurs until quantity demanded is equal to quantity supplied again at higher price and quantity, P_1 and Q_1 . This explains the rise in sales revenue ($P_1Q_1 > P_0Q_0$) in the plant-based market.

Requirement #2: Supply factor explains the rise in sales revenue

It was mentioned that for plant-based producers, costs of sourcing and processing plant proteins are on the rise. Plant proteins are factors of production (inputs) needed in the production of plant-based meat. Cost of sourcing for plant proteins could be rising due to global events and geopolitical tensions that lead to rise in the price of raw materials like soy, pea protein, and other plant-based ingredients. With higher costs of production from sourcing and processing of plant proteins, quantity falls at each price level as producers are less willing and able to produce given falling profitability, leading to the leftward shift of supply from S_0 to S_1 .

Price elasticity of demand measures the responsiveness of quantity demanded of a good to a change in price, *ceteris paribus*. The demand for plant-based meat is likely to be price inelastic ($PED < 1$) due to the lack of close substitutes for the good. This is especially for vegans and those who prefer a healthier version of meat who do not see alternatives as viable substitutes.

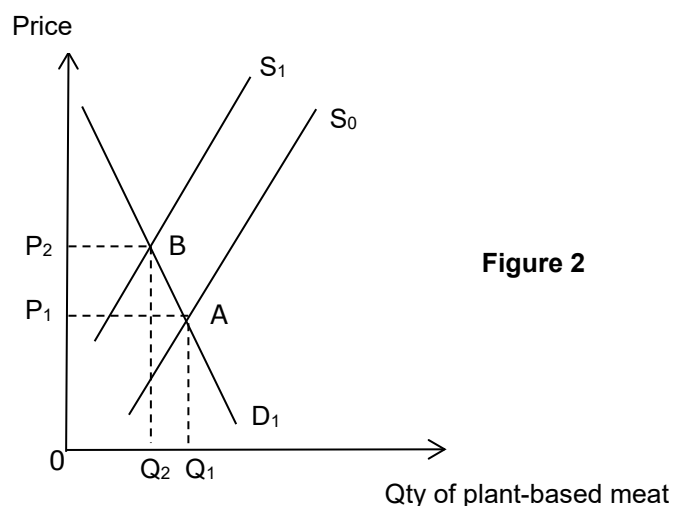


Figure 2

Brief market adjustment process: When supply falls and puts upward pressure on prices due to the shortage, consumers and producers respond by reducing and increasing quantity respectively. Due to plant-based meat having a price inelastic demand, the rise in price will lead to a less than proportionate fall in quantity demanded. The rise in total revenue from the rise in price is greater than the fall in total revenue from the fall in quantity - thus causing sales revenue (Price x quantity) to increase. The market equilibrium price and quantity are now P_2 and Q_2 respectively and total revenue has increased from $0P_1AQ_1$ to $0P_2BQ_2$.

Overall / combined shifts

The rise in demand, coupled with YED for plant-based meat to be greater than 1 will lead to a rise in sales revenue. The fall in supply, in a market whereby PED is inelastic, will also lead to a rise in sales revenue. Both demand and supply factors will reinforce each other to raise sales revenue, thus explaining the boom in sales revenue as stated.

Mark Scheme

<i>Knowledge, Application, Understanding, Analysis</i>		
L1	- A smattering of valid point with no relevant framework applied / largely descriptive answer with very little or no economic framework applied. - Glaring conceptual gaps in explanation whereby question requirements are not clearly addressed.	1 - 4
L2	- Relevant answer but theory may be incompletely explained - Attempts to apply elasticity concepts e.g., PED, YED, but lacks adequate analysis - Some ability at graphs but incomplete explanation in market adjustment process. - Partial analysis of events on the plant-based meat on either changes in demand or changes in supply and link to total revenue	5 - 7
L3	- For a well-developed analysis on how the events lead to an increase in TR, with the use of well-labelled and well-explained graphs - Good application and analysis of the relevant elasticity concepts, PED and YED to explain the increase in TR.	8 - 10

Examiners' comments:

- Part a was generally attempted well by students with the majority understanding the need to consider both the demand and supply factors that cause sales revenue to rise.
- Quite a number of students also recognized that a boom in sales revenue required explanation as to why sales revenue rose sharply and this extended beyond demand and supply shifts.
- Another positive was the quality elaboration of the market adjustment process explaining why prices rose.
- However, there were many students who either failed to bring in income elasticity of demand (preamble hinted at income increase) or brought in elasticity concepts (PES) which did not determine the sharp rise in sales revenue.
- The final area of improvement that students need to work on was the elaboration of the non-price determinant of demand and supply. Too often, students simply stated the determinant and conclude that demand (or supply) shifted.

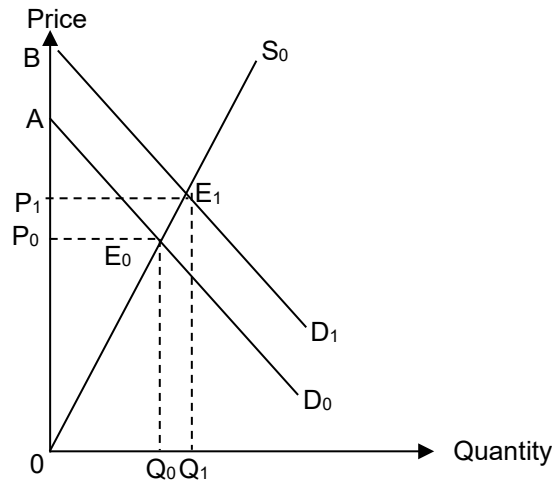
(b) Discuss how changes in the plant-based meat market affect consumers and producers in its related markets. [15]

Introduction

- Identify changes in plant-based meat as increased price and likely increase in quantity.
- Identify how impact on consumers and producers is measured – consumers' expenditure and surplus and producers' revenue and surplus
- Consumer surplus (CS): The difference between maximum amount consumers are willing and able to pay and what they actually pay for given quantity of goods.
- Producer surplus (PS): The difference between amount received by producers and the minimum prices that they are willing and able to accept for supplying additional units of the good.
- Identify the possible related markets: 1) market for vegetarian cooked food that uses plant-based meat as a factor of production 2) substitutes such as regular meats or complements.

Body**R1: Substitutes market such as regular meats****Thesis: Positive impact on regular meats**

Vegan meat and regular meats such as chicken or pork are substitutes as they meet the same wants. Given the rise in price of plant-based meats, consumers will switch to the substitute, which will cause the demand for regular meats to rise. Cross elasticity of demand (CED) is a measure of the responsiveness of the demand of a good to a change in the price of another good, ceteris paribus. As plant-based meats and regular meats are unlikely to be close substitutes for most consumers as they still have a different texture, taste and nutritional value, hence the value is positive and small. With the rise in price of plant-based meat, there will be a small rise in the demand from D_0 to D_1 for regular meat, as consumers switch to the relatively cheaper regular meats.



Market for regular meat such as chicken and pork

Brief market adjustment process: At initial price, P_0 , the rise in demand creates a shortage as quantity demanded is greater than quantity supplied. Consumers and producers will respond to the shortage and price increase by adjusting quantity demanded and quantity supplied until the new higher equilibrium price and quantity P_1 and Q_1 are reached.

Impact on Consumers: At higher price, P_1 and Q_1 , consumers expenditure (price $\times$ quantity) increased, and consumers' surplus has risen from AE_0P_0 to BE_1P_1 due to a larger difference between what consumers are willing and able to pay and what they actually paid. Despite the higher price paid, consumers' welfare has improved due to the rise in consumer surplus and increased in quantity consumed for more consumers.

Impact on Producers: Similarly, producers' welfare has improved as revenue increased due to higher price and quantity. Producers' surplus has also increased from P_0E_0O to P_1E_1O due to the larger difference between what producers received and the minimum amount they are willing to able to accept.

Anti-thesis: Extent of impact on Consumers and Producers

While a rise in the cost of vegetarian food might normally be expected to increase demand for substitutes like chicken and pork (as consumers seek more affordable protein options), this substitution effect may be weakened or entirely offset by a deeper, structural shift in consumer preferences away from meat altogether. Due to the change in taste and preference towards plant-based meat, there could be an overall fall in demand for regular meats rather than an increase. This will cause a fall in price and quantity accompanied by falling consumers' and producers' surpluses.

Alternatively, students can argue that the magnitude of CED may differ for different types of meat substitutes – chicken, beef and pork. Research showed that plant-based meats are often seen as closer substitutes for chicken as compared to beef, especially due to the texture and flavor profiles of certain plant-based options. Thus, the impact on demand for chicken versus beef will differ when plant-based meat prices increase. Chicken consumers and producers may see larger increase in welfare.

Evaluation/R1:

Although the rising cost for vegetarian food suggests a shift towards meat, the impact on different types of meat will vary depending on how closely consumers view them as substitutes for plant-based alternatives. For example, processed plant-based products may more closely replicate chicken, making these meats more likely to benefit from substitution.

While younger consumers are leading the shift toward plant-based diets, older generations often retain traditional dietary habits and may be less responsive to trends driven by environmental or ethical concerns. This generational inertia means that a significant portion of the market may continue to

demand regular meats, even if vegetarian options become more popular and widely available. Thus, price increases in plant-based meat may have minimal impact on regular meats.

R2: Market for Vegan / Vegetarian restaurant food (Final Product)

Thesis: Explain impact on price, quantity, expenditure/revenue, consumers' and producers' surplus.

With the rise in price of plant-based meat as a key factor of production, vegetarian / vegan restaurants see a rise in the cost of production. This reduces profitability for these firms; hence they are less willing and able to produce at every given price level, thus supply shifts left from S_0 to S_1 (refer to Figure 3). Demand for vegan / vegetarian restaurant food is likely to be price inelastic in demand ($PED < 1$) due to the lack of substitutes (not many specialty vegetarian restaurants in comparison) in this market.

This generates a shortage at the original price level, and prices rise from P_0 to P_1 , and equilibrium quantity falls from Q_0 to Q_1 via the market adjustment process. The rise in price is more than proportionate to the fall in quantity demanded. Hence total revenue/total expenditure rise from P_0Q_0 to P_1Q_1 .

Impact on Consumers: Consumers' surplus falls from AE_0P_0 to AE_1P_0 as the difference between what consumers are willing and able to pay and what they actually pay has become smaller. Consumers are worse off due to higher price, falling quantity and reduction in consumers' surplus.

Impact on Producers: Producer surplus also fell (due to the higher cost of production) from P_0E_0C to P_1E_1B because the difference between what they actually received and minimum amount they are willing and able to accept has also become smaller.

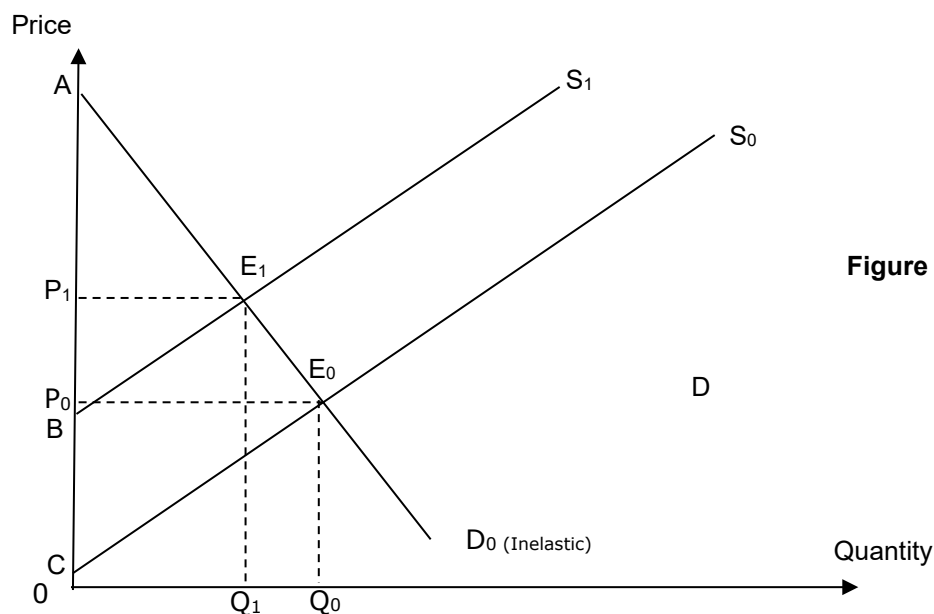


Figure 3

Market for Vegan / Vegetarian Restaurant

Anti-thesis: Extent of impact on Consumers and Producers

While price of plant-based meat has increased, there is also a shift in taste and preferences towards plant-based meat (whether for its health benefits, or its smaller impact on the environment). These vegan/vegetarian restaurants are likely to see a rise in demand due to those changes in taste and preferences within society. Furthermore, with the rise in incomes stated in preamble and restaurant food being closer to a luxury good with $YED > 1$, the demand for such food is likely to increase more than the fall in supply. The increase in price and quantity will thus cause total revenue/expenditure to rise, with a corresponding rise in producers' and consumers' surplus.

Alternatively, students can argue that $PED_{\text{vegan restaurants}} > 1$. TR/Total expenditure may fall, but CS and PS will still fall.

Evaluation/ R2:

In the short run, although a rise in consumer preference for vegetarian food shifts demand for these restaurants rightwards, potentially increasing willingness to pay, this is more than offset by the rise in ingredient costs. This rise in ingredient costs could be more significant as competing use for these ingredients leads to sharp rises in cost of production for producers. The final outcome of high prices and falling quantity would lead to reduction in consumers' and producers' surpluses.

However, in the long run, with sustained increase in demand and shifting preferences towards vegetarian food, producers within the market may be able to raise prices without losing customers. This could lead to larger producers' surplus despite the cost pressure.

Concluding Evaluation: Considering both R1 and R2

Whether the trend towards plant based meat takes off in a big way and affects the dietary preferences of the rest of the population. If it does, the impact on the related markets will be intensified. For example, welfare of producers in the regular meats market will significantly be affected. Whether producers in the regular meats market are able to effectively respond to the "threat" of plant based meats. These producers could R&D to innovate healthier meats or improve yields of regular meats to ease its demands on limited earth's natural resources. Marketing of regular meats to increase the appeal of regular meats to millennials will also be important. If regular meats producers are able to respond effectively, they may be able to reduce the negative impact of the emergence of plant based meats competitors.

Or

The simultaneous rise in the cost and demand for plant-based meats creates contrasting welfare effects in both vegetarian and regular meat markets. In the vegetarian restaurant market, consumers may face higher prices and reduced consumer surplus, especially if demand is price inelastic and overall quantity fell.

In contrast, the regular meat market may see a continued fall in consumer and producer surplus over time, as changing preferences toward plant-based diets outweigh any short-term substitution effects from rising vegetarian food prices. Overall, consumer and producer welfare shifts away from traditional meat and towards plant-based offerings, though impact will be dependent on ability of consumers and producers in those markets to adapt to the changes.

Mark Scheme

<i>Knowledge, Application, Understanding, Analysis</i>		
L3	- Well-developed analysis including how the events lead to a change in consumer and producer surplus in the plant-based meat market <u>and two related markets</u>, with the use of well-labelled and well-referenced diagrams - Application and analysis of the relevant elasticity concepts	8 - 10
L2	- Relevant answer but theory may be incompletely explained. - Attempts to apply elasticity concepts but lacks adequate analysis. - Uses economic framework to explain impact on producers and consumers in only one related market OR on producers/ consumers (only) but in two related markets.	5 - 7
L1	- A smattering of valid point with no relevant framework applied / largely descriptive answer with very little or no economic framework applied. - Glaring conceptual gaps in explanation whereby question requirements are not clearly addressed.	1 - 4

Evaluation		
E3	Judgements provided for 2 requirements with clear and contextualised justification PLUS a summative judgement in the concluding paragraph	5
E2	Judgment with clear and contextualised justification on what would be the overall impact on producers and consumers in the related markets.	3-4
E1	An attempt at judgement but with limited justification.	1-2

Examiner's Comments

- *Part b) was not attempted well by the majority of the students and this was primarily due to poor time management. The other main factor why this part of the question was poorly attempted was that many students did not understand the requirement of the question.*
- *This failure to recognise the importance of consumers' and producers' surplus in assessing the impact on the related markets meant that critical marks were lost. Students need to realise that when a question is phrased in such a manner, outcomes need to go beyond price, quantity and total revenue/expenditure.*
- *Due to poor time management, critical segments of the answer were undeveloped. Thesis explanation was lacking rigour, anti-thesis was too brief, or evaluation was non-existent.*
- *Quite a number of students brought in CED for normal meat as a substitute to plant-based meat. However, since $CED_{normal\ meat}$ in this case was in relation to price of plant-based meat, the demand for normal meat should rise as price of plant-based meat rose (part a). Many students mistakenly argued that the CED value implied that demand for normal meat should fall.*
- *Another weakness shown in many scripts is the failure to identify the "changes" in the plant-based meat market as an increase in price and/or likely increase in quantity, which is critical as it underpins the clarity and relevance of the entire analysis. As a result, many responded incorrectly to rising demand, rising costs of production of plant-based meat.*