GCE AS/A LEVEL

S25-2520U20-1

2520U20-1

MONDAY, 19 MAY 2025 – MORNING

ECONOMICS – AS unit 2
Economics in Action

2 hours

2520U201
01

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a calculator;
- a WJEC pink 16-page answer booklet.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
You may use a pencil for graphs and diagrams only.
Answer **all** questions.
Write your answers in the separate answer booklet provided.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.

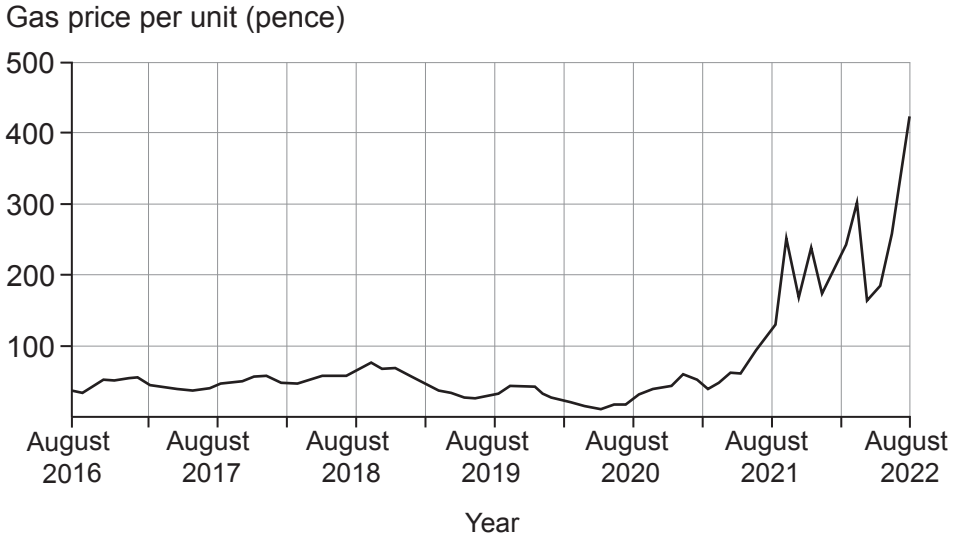
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Answer **all** questions.

1. Heating Up

Figure 1: UK natural gas price, August 2016 – August 2022



Source: tradingeconomics.com



85% of UK households use a traditional gas boiler to heat their houses. In August 2022, the price of gas increased to record levels in the UK. As a result, many households bought **wood-burning stoves** as a cost-effective alternative to gas boilers. Sales of stoves doubled in the 6 years to August 2022.

A wood-burning stove is a heating appliance capable of burning wood as fuel. The typical price is £800 – £1000 (plus another £1000 for installation). Research suggests that a wood-burning stove could potentially cut heating bills by around 10%.

The spike in popularity, however, is not without its economic challenges. Recent data reveals that wood-burning stoves can be linked to severe health risks and carbon dioxide emissions. Heating a typical home with a gas boiler results in 3300 kg of carbon dioxide annually, but wood-burning stoves produce a lot more. For example, some older models can result in more than 10 000 kg of carbon dioxide emissions over the same time period. The government has come under pressure recently to apply indirect taxes to wood-burning stoves in order to reduce emissions.

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A newer, alternative source of heating is an **air source heat pump**. This is an appliance that extracts heat from the outside air to provide heating for buildings or to generate hot water. Manufacturers claim that it offers a more energy-efficient and environmentally friendly alternative to a gas boiler.

Heat pumps are seen as important to meeting the UK's 2035 climate targets by reducing carbon emissions from heating buildings. The government's stated ambition is for 600 000 heat pumps to be installed every year for 5 years (2023 to 2028). Heat pumps can be very expensive though. Prices vary but the average price is around £12 500 and, as a result, heat pumps are still unaffordable for many households.

In October 2023, the government introduced a £7500 subsidy per heat pump in order to incentivise more households to buy them. The government expects the scheme to cost £450 m over the next five years.

(a) Using **Figure 1**, calculate the approximate percentage change in the price of natural gas from August 2016 to August 2022. [2]

(b) (i) Using an example from the data, outline the concept of opportunity cost. [2]

(ii) Using an example from the data, outline the concept of complementary goods. [2]

(c) Using the data, discuss whether wood-burning stoves and gas boilers can be considered strong substitutes. [10]

(d) Draw a negative externalities diagram to illustrate the market failure associated with wood-burning stoves. **No explanation is necessary.** [4]

(e) Using a diagram, discuss the advantages of using indirect taxes to reduce the sales of wood-burning stoves. [10]

(f) Using a subsidy diagram, evaluate the extent to which government subsidies may lead to government failure. [10]

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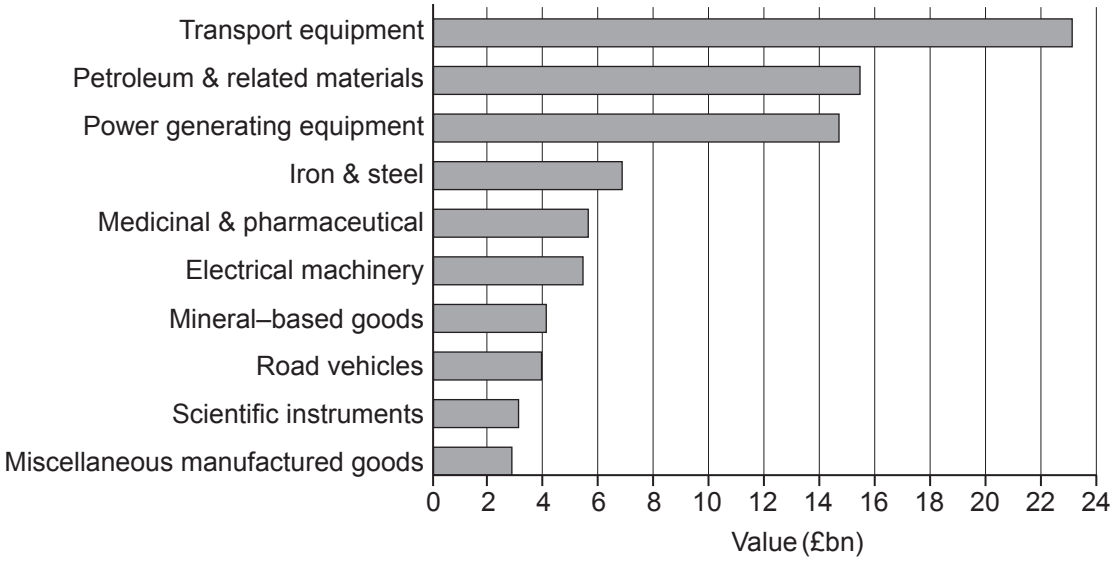
2. All about trade

Extract A

According to official data, Wales engaged in export trade totalling £115.5 bn in the 7 years to December 2022. This implies that Wales had an average yearly export total of £16.5 bn.

Wales' top three export destinations are the USA, the Republic of Ireland and Germany. But it exports to more than 100 countries worldwide. For example, in 2022, Wales exported £128 m worth of goods to Brazil, £56 m to South Africa and £53 m to Malaysia.

Figure 2: Wales' exports: top 10 products by value (£bn)



Based on total export values from 2016–2022

As **Figure 2** shows, two important sectors driving Wales' exports are the transport equipment industry and petroleum products.

- Transport equipment includes the building (and selling) of ships, boats, trains and aircraft. Wales hosts a major aviation manufacturing site in Flintshire where nearly 5000 people produce wings for Airbus planes.

- Petroleum products is often a surprise given Wales' limited association with oil. The Valero refinery in Pembrokeshire processes 270 000 barrels of crude oil daily, producing petrol and related products, a substantial portion of which is exported globally.

The agricultural industry, by contrast, doesn't make the top ten list for exports. Welsh lamb exports have an estimated annual value of less than £0.1 bn.

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Extract B

Welsh agriculture, key statistics:

- 90% of Wales' total land area is used for agriculture.
- Agriculture contributes £0.7 bn (or 1%) to Wales' total Gross Value Added (GVA).
- Agriculture accounts for 1.8% of total employment in Wales.
- In large rural parts of Wales, such as Ceredigion and Powys, jobs in agriculture account for more than 12% of workplace jobs.

Between 2016 and 2023, the Pound lost more than 10% of its value against the Euro. Nevertheless, the UK continues to import many more goods than it exports. To try and combat this trade deficit, the UK announced a free trade agreement (FTA) with Australia in December 2021. The FTA removed all import tariffs on imports of Australian lamb into the UK.

Welsh farmers criticised the trade deal, claiming that it would lead to a rise in imports and a fall in the domestic price of lamb. By the end of 2023, however, these worries had not yet been realised. At the time of writing, imports of Australian lamb had not increased beyond long-term trends and prices were well above the 5-year average.

(a) Calculate the value of Welsh exports to Brazil, South Africa and Malaysia in 2022, as a percentage of Wales' average yearly export total. [2]

(b) With reference to the functions of prices, explain how the free market allocates resources to different sectors such as agriculture or petroleum. [4]

(c) With reference to **Extract B**, outline two supply-side policies that might increase the potential output of the agricultural industry in Wales. [6]

(d) Consider whether increasing net exports (value of exports minus value of imports) is always desirable for an economy. [8]

(e) Discuss the likely impact of a depreciation of the Pound against the Euro on the value of Welsh exports. [10]

(f) Using a tariff diagram, discuss the extent to which removing an import tariff on lamb may negatively affect the Welsh economy. [10]

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Surname	StemUp Model Solution
Answer booklet	Write the question number in the left-hand margin at the start of each answer.

Question number	
1 (a)	August 2016 price ≈ 40p per unit; August 2022 price ≈ 420p per unit. % change = (420 − 40) ÷ 40 × 100 = 380 ÷ 40 × 100 = 950% The price of gas rose by approximately 950%.
1 (b)(i)	Opportunity cost is the value of the next best alternative forgone when a choice is made. For example, the heat pump subsidy is expected to cost the government £450 m over five years (lines 33 to 34): the opportunity cost is the next best use of that money, such as extra funding for the NHS. Likewise, a household that spends £800 to £1000 (plus £1000 installation) on a stove gives up its next best alternative, such as staying with gas heating.
1 (b)(ii)	Complementary goods are goods that are used together (joint demand), so they have a negative cross elasticity of demand: a rise in demand for one leads to a rise in demand for the other. For example, wood fuel is a complement to wood-burning stoves: as high gas prices caused sales of stoves to double (line 6), the demand for firewood to burn in them also rose. Installation services (£1000, line 9) are another complement.
1 (c)	Substitutes are goods that satisfy the same want, so they are in competitive demand: a rise in the price of one causes an increase in demand for the other. The strength of the relationship is measured by cross elasticity of demand: XED = %ΔQd of good A ÷ %ΔP of good B. Substitutes have a positive XED, and strong (close) substitutes have a high positive XED (above 1), where a relatively small change in the price of one leads to a large change in the demand for the other.

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There is evidence that wood-burning stoves and gas boilers are strong substitutes. Both perform the same function, heating the home. Figure 1 shows the price of gas rising from about 40p to about 420p per unit between August 2016 and August 2022 and, "as a result", many households bought wood-burning stoves as a "cost-effective alternative to gas boilers" (lines 4 to 6). Sales of stoves doubled, a 100% increase (line 6). The rise in the running cost of a gas boiler made the substitute relatively more attractive, so the demand curve for stoves shifted to the right. Research also suggests a stove could cut heating bills by around 10% (lines 10 to 11), and at £800 to £1000 a stove is far cheaper than a heat pump at £12,500, so switching is affordable for many households. This positive relationship shows the goods are substitutes.

However, there are reasons to doubt that they are strong substitutes. First, the gas price rose by about 950% while stove sales rose by only 100%, giving an approximate XED of 100 ÷ 950 ≈ +0.1. This is positive but far below 1, suggesting weak substitutes. Strictly, we have no data on the change in the price of gas boilers themselves, only of the gas they burn. Second, the change is measured over 6 years, so stove sales may have been affected by other factors such as rising incomes, changing tastes or advertising: ceteris paribus does not hold. Third, 85% of UK households still use a gas boiler (line 1), so despite a huge rise in gas prices most households did not switch. This is because switching costs are high (a stove plus £1000 for installation), so demand for gas heating is price inelastic in the short run.

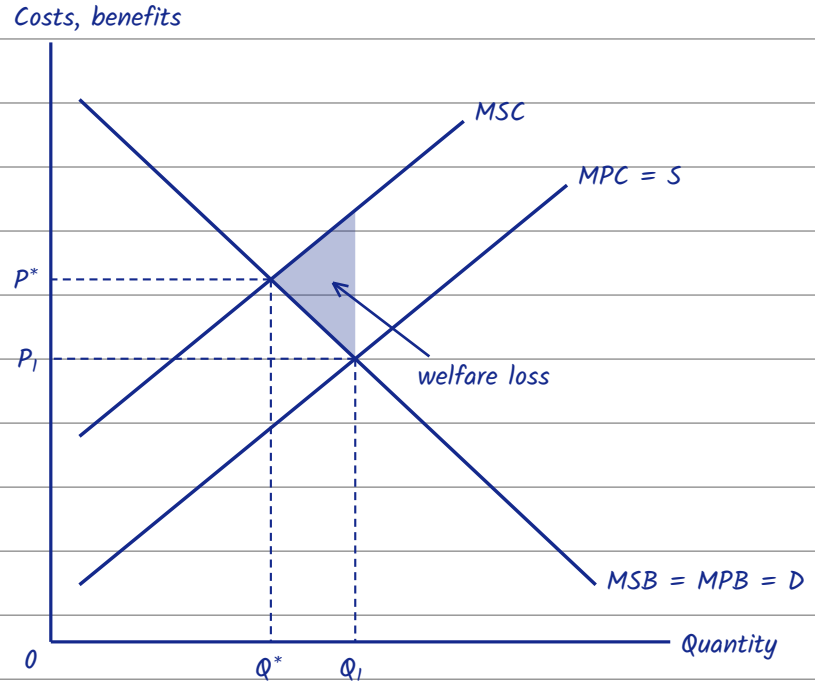
Fourth, the goods are not identical. A boiler heats water as well as the whole home, whereas a stove heats only the home, often a single room. Stoves are also linked to severe health risks and produce far more carbon dioxide: over 10,000 kg a year for some older models compared with 3300 kg for a gas boiler (lines 14 to 16). For environmentally aware households, and with the threat of indirect taxes, this makes stoves a poorer substitute.

Overall, wood-burning stoves and gas boilers are substitutes, as the positive response of stove sales to the rise in the gas price shows, but the evidence

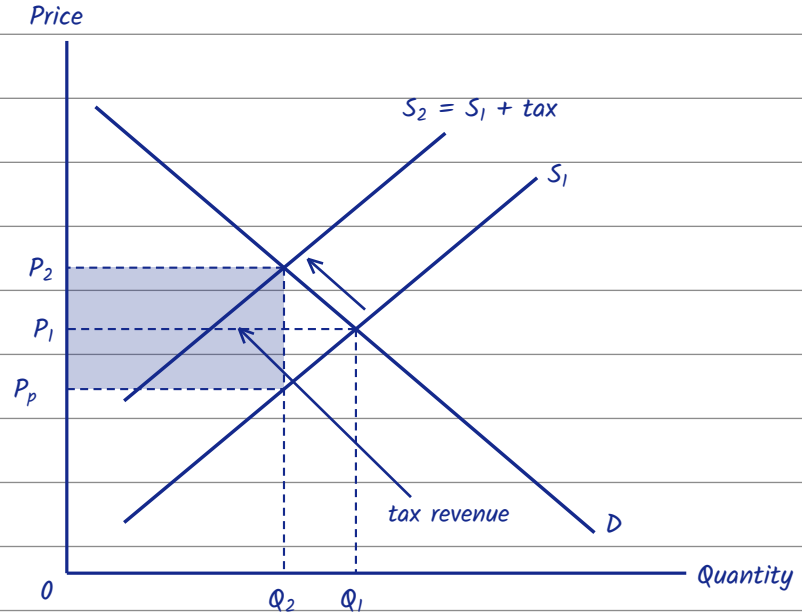
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suggests they are weak rather than strong substitutes: the XED is low and most households have stayed with gas. Many households probably use a stove alongside their boiler to cut bills by around 10%, rather than as a full replacement. The relationship may become stronger in the long run if gas prices stay high, as switching costs can be spread over time.

1 (d)



1 (e)



An indirect tax is a tax on expenditure, paid to the government by producers,

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which raises their costs of production. A specific (unit) tax on wood-burning stoves shifts the supply curve vertically upwards by the amount of the tax, from S_1 to S_2, as the diagram above shows. The equilibrium price rises from P_1 to P_2 and the quantity of stoves bought falls from Q_1 to Q_2. The shaded area is the tax revenue: $(P_2 - P_p) \times Q_2$.

As the diagram shows, the main advantage is that the tax reduces sales and internalises the negative externality. Stoves "can be linked to severe health risks and carbon dioxide emissions" (lines 13 to 14), with some older models producing more than 10,000 kg of CO_2 a year compared with 3300 kg for a gas boiler (lines 14 to 16). Consumers ignore these external costs, so stoves are overconsumed. By raising the price above the typical £800 to £1000, the tax makes buyers pay closer to the full social cost, so quantity falls towards the socially optimal level where MSC = MSB and the welfare loss is reduced. Fewer stoves means less air pollution, fewer respiratory illnesses, lower NHS costs and lower carbon emissions, helping the UK meet its 2035 climate targets.

Second, the tax raises revenue, which could be hypothecated to fund cleaner alternatives, for example the £450 m heat pump subsidy, so relative prices shift in favour of greener heating. Third, it works through the price mechanism: consumers keep freedom of choice and those who value a stove most can still buy one, so it is less distortionary than a ban.

However, effectiveness depends on price elasticity of demand. If demand for stoves is price inelastic, for example because gas is so expensive (around 420p a unit in 2022) that households see few alternatives, quantity will fall only slightly and most of the burden falls on consumers: revenue is high but emissions hardly fall. The tax also only affects new purchases; the many stoves already installed (sales doubled in 6 years) keep burning wood, so a tax on wood fuel might be better targeted.

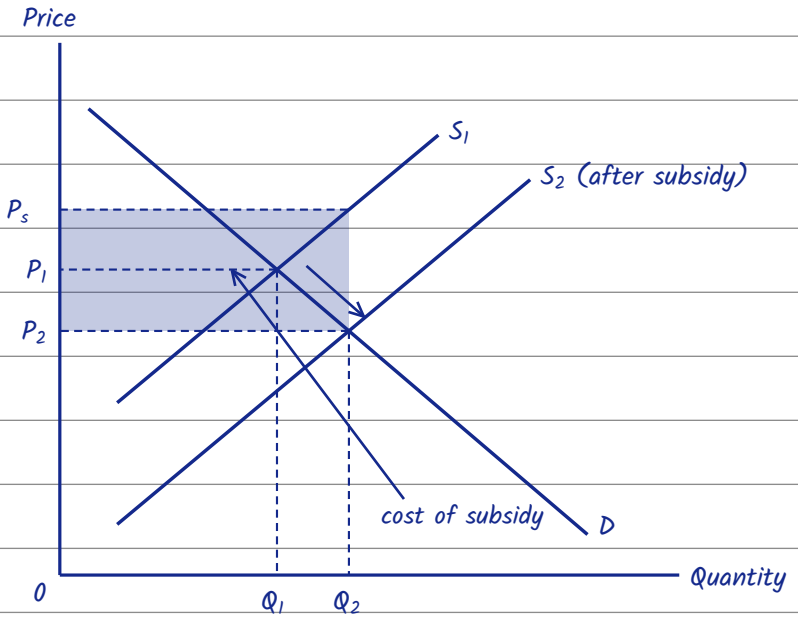
Indirect taxes are also regressive. Low-income households spend a larger share of their income on heating, and many bought stoves because they could not

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afford record gas prices, so the tax could increase fuel poverty. The external cost is hard to value, so the tax may be set at the wrong level, risking government failure, and it could create an informal market in second-hand, uncertified stoves.

Overall, an indirect tax has clear advantages in reducing sales and raising revenue, but it is most effective in the long run and when combined with subsidies for heat pumps and regulation of the most polluting older models, so that low-income households have an affordable alternative.

1 (f) A subsidy is a payment from the government to producers that lowers their costs of production. A per-unit subsidy on heat pumps shifts supply from S_1 to S_2, as the diagram below shows. The price consumers pay falls from P_1 to P_2 and quantity rises from Q_1 to Q_2. The shaded rectangle is the cost of the subsidy to the government: in October 2023 it introduced a £7500 subsidy per heat pump, expected to cost £450 m over five years (lines 32 to 34).



Government failure occurs when government intervention leads to a less efficient allocation of resources and a net loss of economic welfare. Subsidies can cause this in several ways. First, information failure: the government may not know the true size of the external benefit. If the subsidy is too large, output rises beyond the socially optimal level, causing overproduction and a new

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welfare loss. Second, the subsidy may be too small: the average heat pump costs around £12,500 (line 30), so even after £7500 a household still pays about £5000 plus installation, compared with £800 to £1000 for a wood-burning stove. Many households will still find heat pumps unaffordable, so demand may rise little. In fact, £450 m ÷ £7500 = 60,000 subsidised pumps over five years, only 2% of the 3 million (600,000 × 5) target, so the scheme is too small to correct the market failure.

Third, there is an opportunity cost: the £450 m could have been spent on the NHS or education, which may give greater social benefits. Fourth, subsidies distort price signals and encourage rent-seeking: if supply is inelastic, much of the subsidy is captured by producers as a higher price received (P_s) rather than passed on as lower prices, and firms may lobby for subsidies rather than innovate to cut costs. Subsidies can also be inequitable, as better-off homeowners are most able to pay the remaining cost.

On the other hand, a subsidy may correct market failure rather than cause government failure. Heat pumps are "more energy-efficient and environmentally friendly" than gas boilers (lines 22 to 24) and create positive externalities by cutting carbon emissions, so they are under-consumed in a free market. Subsidising them moves consumption towards the social optimum where MSB = MSC, increasing welfare. Wider adoption may also generate economies of scale, lowering heat pump prices in the long run, and reduce reliance on gas, whose price rose by about 950% (Figure 1), improving energy security.

The extent of government failure therefore depends on the size of the subsidy relative to the external benefit, the price elasticity of demand and supply, and the time period. In the short run, with a net price of around £5000, the quantity bought may rise little and £450 m may be misallocated. In the long run, if costs fall and installations rise, the benefits are likely to outweigh the costs. On balance, subsidies are more likely to correct market failure than cause government failure, provided they are well targeted, for example means-tested towards low-income households.

Question number	
2 (a)	Total = £128 m + £56 m + £53 m = £237 m Average yearly export total = £16.5 bn = £16,500 m 237 ÷ 16,500 × 100 = 1.44%
2 (b)	In a free market, resources are allocated by the price mechanism, the interaction of demand and supply, without government intervention. Prices perform three functions. Signalling: if global demand for petroleum products rises, the price rises, signalling to producers such as the Valero refinery that more is wanted. Incentive: the higher price raises potential profits, giving firms an incentive to expand output, so factors of production (land, labour and capital) move out of less profitable sectors into petroleum. Rationing: the higher price also rations the scarce product to the consumers most willing and able to pay. Conversely, if the price of lamb falls because of cheaper imports, lower profits signal Welsh farmers to move resources out of agriculture into more profitable uses.
2 (c)	Policy 1: subsidies or tax relief for investment in agricultural technology, such as precision farming, smart irrigation and better machinery. This raises the productivity of land and labour, so more can be produced from the same resources, shifting the industry supply curve and potential output outwards. This matters because 90% of Wales' land is used for agriculture but it contributes only £0.7 bn (1%) of Wales' GVA (lines 20 to 21), showing low output per hectare. Higher productivity would also help Welsh farmers compete with tariff-free Australian lamb under the FTA. Policy 2: education and training for farmers, for example funded courses in agri-business, new technology and land management. This improves human capital and labour productivity, increasing potential output. Agriculture accounts for only 1.8% of total employment in Wales, but more than 12% of workplace jobs in rural areas such as Ceredigion and Powys (lines 22 to 24), so a

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	better-skilled workforce would raise output and incomes in these areas and help farmers stay competitive after the trade deal.
2 (d)	Net exports (X – M) are a component of aggregate demand: AD = C + I + G + (X – M). Increasing net exports is often desirable. First, it shifts AD to the right and, through the multiplier effect, increases real GDP and economic growth, creating jobs and reducing unemployment, for example in Welsh transport equipment, worth around £23 bn of exports over 2016 to 2022 (Figure 2). Second, it improves the current account: the UK "continues to import many more goods than it exports" (line 26), so higher net exports reduce the trade deficit and the need to borrow from abroad or sell assets. Third, higher demand for exports raises demand for the Pound, which can build up foreign currency reserves and lead to an appreciation that makes imports cheaper, reducing imported inflation. Rising exports also show firms are internationally competitive, which can attract FDI and encourage innovation. However, it is not always desirable. If the economy is close to full capacity, the extra AD mainly causes demand-pull inflation rather than higher real output. Net exports may also rise for undesirable reasons: in a recession incomes fall, so imports fall and net exports increase even though living standards are falling, a sign of weak domestic demand. If net exports rise because of a large depreciation, imported food and raw materials become dearer, reducing real incomes. A persistent surplus means a country consumes less than it produces while trading partners run deficits, which can cause trade tensions and retaliatory tariffs, and the resulting appreciation may later reduce export competitiveness. Therefore, increasing net exports is desirable when it comes from greater competitiveness (productivity and quality) and the economy has spare capacity, as with the UK's current trade deficit, but not when it results from weak domestic demand or occurs at full employment. It is not always desirable.

Question number	
2 (e)	A depreciation is a fall in the value of a currency against another in a floating exchange rate system: between 2016 and 2023 the Pound lost more than 10% of its value against the Euro (line 25). Exports are goods and services produced in Wales and sold abroad, bringing money into the economy; Wales' average yearly export total is £16.5 bn (line 2). A depreciation makes Welsh exports cheaper in Euros. For example, if £1 fell from €1.20 to €1.08 (10%), a £10,000 Welsh product would fall from €12,000 to €10,800 for an Irish or German buyer. Exports become more price competitive, so the quantity demanded abroad rises and, as each unit still earns the same Pound price, the value of exports in Pounds rises. This is significant because two of Wales' top three export destinations, the Republic of Ireland and Germany (line 4), use the Euro. Petroleum products from the Valero refinery (about £15.5 bn over 2016 to 2022), power generating equipment and Airbus wings could all gain sales in the Eurozone. A weaker Pound also makes Wales cheaper for Eurozone tourists, boosting service exports. Higher exports raise AD, output and jobs, such as the 5000 workers in Flintshire. However, the size of the effect depends on price elasticity of demand. Demand for petroleum is likely to be price inelastic and is often priced in US dollars, so the depreciation may change sales little. Aircraft wings are sold under long-term contracts with Airbus, so demand responds slowly. The Marshall-Lerner condition states that a depreciation only improves the trade balance if the sum of the PEDs for exports and imports is greater than 1, and the J-curve shows the balance may worsen in the short run before improving as contracts are renegotiated. Second, Welsh manufacturers rely on imported inputs, such as the 270,000 barrels of crude oil refined daily in Pembrokeshire and components for aircraft. A depreciation raises the cost of these imports, increasing production costs and offsetting part of the price advantage. Third, the Pound has fallen against the

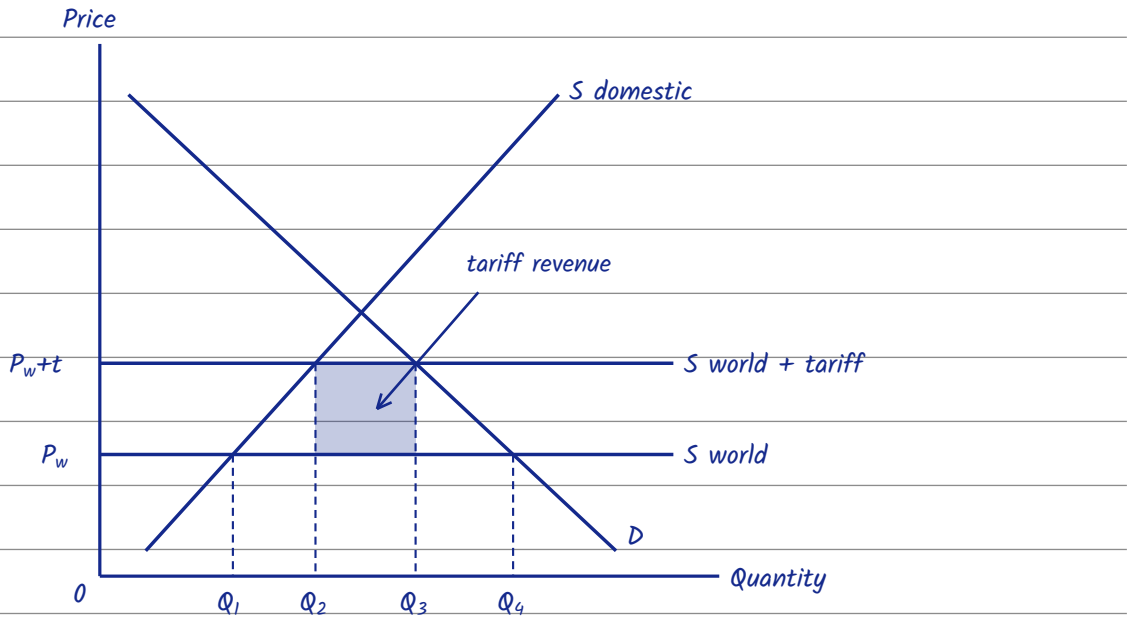
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Euro but may not have fallen against the US dollar, and the USA is Wales' largest export market. Fourth, it depends on conditions abroad: if the Eurozone or USA is in recession, incomes are falling and demand for Welsh exports may fall despite lower prices. Finally, exports depend on non-price factors such as quality, reliability and delivery times, which matter more than price for high-tech goods like aircraft wings.

Overall, a depreciation against the Euro is likely to increase the value of Welsh exports, especially to Ireland and Germany, but the effect will probably be small in the short run because Wales' main exports are price inelastic, import-intensive and partly sold to the USA. The effect is likely to be larger in the long run if the depreciation is sustained.

2 (f)

A tariff is a tax on imports. As the diagram below shows, with free trade the world price of lamb is P_w. A tariff raises the price of imported lamb to P_w+t, so domestic producers supply Q_2, consumers demand Q_3 and imports are Q_2 to Q_3. When the tariff on Australian lamb is removed under the December 2021 FTA (lines 27 to 28), the price falls to P_w: domestic supply contracts to Q_1, demand extends to Q_4, and imports rise to Q_1 to Q_4.



This may negatively affect the Welsh economy. Welsh farmers claimed the deal "would lead to a rise in imports and a fall in the domestic price of lamb"

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(lines 29 to 30). Domestic output falls from Q_2 to Q_1, so farm revenues, incomes and producer surplus fall. As the demand for labour is derived from the demand for lamb, jobs may be lost. Agriculture is only 1.8% of employment in Wales, but over 12% of workplace jobs in rural areas such as Ceredigion and Powys (lines 22 to 24), so job losses would be concentrated there, causing regional unemployment and widening inequality between rural and urban Wales. Higher imports also worsen the trade balance when the UK already "continues to import many more goods than it exports" (line 26), and the government loses the tariff revenue (shaded). Shipping lamb from Australia also adds to carbon emissions.

However, the negative effects may be limited. By the end of 2023, imports of Australian lamb "had not increased beyond long-term trends" and prices "were well above the 5-year average" (lines 31 to 32). Australian producers may prefer closer Asian markets, and transport costs and consumer loyalty to Welsh lamb (a non-price factor) protect demand. The fall of over 10% in the Pound also makes imports dearer, offsetting the removal of the tariff. Moreover, Welsh lamb exports are worth less than £0.1 bn a year (line 17) and agriculture is just 1% of Welsh GVA, so the effect on the whole economy is small.

There are also benefits. Consumers gain from lower prices and more choice: the gain in consumer surplus exceeds the loss of producer surplus and tariff revenue, so the deadweight losses of the tariff are removed and allocative efficiency improves. Cheaper food lowers inflation, helping low-income households, and competition may force Welsh farmers to become more efficient and innovative in the long run.

In conclusion, removing the tariff is likely to have only a small negative effect on the Welsh economy as a whole, but a significant one for rural communities that depend on sheep farming. The size of the effect depends on how far the price of imported lamb falls, the price elasticity of domestic supply and demand, and the time period, as tariff-free quotas expand over time.