ST ANDREW'S JUNIOR COLLEGE
2024 JC1 H1 ECONOMICS
MICROECONOMIC OBJECTIVES AND POLICIES

Section A: Case Study Question

Question 1 [2021 HCI H1 Prelim (Adapted)]

Extract 1: Markets associated with climate change

A Driving

Stockholm County's population was expanding fast by 20,000 people annually. With more than half a million cars zooming in and out of the city, bottlenecks and delays were becoming ever present, with potential to get even worse, deteriorating air quality in built up city areas. Stockholm officials decided upon a road-charging system. The concept was simple enough: each Swedish-registered vehicle entering and leaving the city centre between 6:30 a.m. and 6:30 p.m. on weekdays would pay a fee - the equivalent of US$3. Communications about the benefits were especially important, not just about less traffic and reduced CO2 levels, but also about how the funds gathered would be channelled back into Stockholm infrastructure. However, a key hurdle faced by the Swedish government is the limited availability of accurate cross-sectional data to determine the effects of such a fee on congestion patterns.

B Single-use plastics

Plastic production is expanding worldwide. Plastic contributes to greenhouse gas emissions at every stage of its lifecycle, from its production to its refining and the way it is managed as a waste product. Disposable cutlery, glasses, plates and plastic cotton buds are among a selection of single-use plastics that were outlawed in March following a vote in the European Parliament. To be fully implemented in 2021, the ban is based on the European Union's single-use plastics directive and aims to tackle marine litter coming from the single-use plastic products most often found on European beaches.

Sources: *Various*

With reference to Extracts 1A and 1B,

(i) Explain negative externalities in consumption and production using examples. **[4]**

(ii) Discuss why one government chooses to use tax while the other adopts ban to achieve efficient allocation of resource. **[8]**

[Total: 12 marks]

Question 2 [2021 JPJC H1 Prelim]

Fighting Climate Change

Extract 1: Climate change threatens the world's food supply, United Nations warns

The world's land and water resources are being exploited at "unprecedented rates," a new United Nations report warns, which combined with climate change is putting dire pressure on the ability of humanity to feed itself. The report, highlighted that half-billion people are already living in places turning into desert, and soil is being lost between 10 and 100 times faster than it is forming. Climate change will make those threats even worse, as floods, drought, storms and other types of extreme weather threaten to disrupt, and over time, shrink the global food supply. Global warming is exacerbating food insecurity by destroying crop yields, decreasing livestock productivity and increasing pests and diseases on farmland. Food security, as defined by the United Nations, means that people, at all times, have access to safe, affordable, sufficient and nutritious food for an active and healthy life.

Adapted from *www.nytimes.com*, 8 August 2019, accessed 17 Aug 2021

Table 1: Consumer price index (CPI) of India (Annual % change)

Year	CPI (Food)	CPI (All items)
2018	2.2	3.6
2019	0.7	3.4
2020	6.0	6.8

Source: *www.rbi.org*

Extract 2: High food inflation in India is forcing families to choose between good meals and education

In December 2019, consumer food price inflation hit 14.1% in India, the highest in six years. For working class consumers like Trupti Kamle, the relentless rise in food prices has meant constantly having to make tough decisions. For the past five months, Kamle has been torn between two difficult choices: either saving money for her son's education or ensuring that he is fed well.

In most parts of India, prices of vegetables and many fruits were driven high because of crop damages caused by excessive and unseasonal rains, which hit supplies. Onions saw an almost 200% rise in prices in November and December 2019, sparked by a poor harvest last year and wheat and other cereals have also seen a price inflation. Other factors contributing to rising food prices include rising urban population growth and income.

Source: *https://qz.com/india/1785157/*, accessed 15 January 2020

Extract 3: Ammonia pollution damaging more than 60% of UK land

Pressure on farmers to increase food yield is forcing many to adopt intensive agricultural practices for crop production in many parts of the world. The use of animal waste and excessive fertilisers to increase food yield has led to severe ammonia and nitrogen pollution.

Experts and activists are calling for urgent government action to stem the rise of ammonia emissions as it combines with other pollutants in the air to form fine particulates that pose a

grave danger to human health. At least 3,000 deaths a year could be prevented by halving agricultural emissions of ammonia, according to a joint investigation by the Guardian and the Bureau of Investigative Journalism.

Civil society groups called for sweeping reforms to the way farms are monitored and regulated. Adhering to the regulations and proposed reforms may raise costs but unless urgent action is taken, the government is on track to miss legally binding commitments to reduce ammonia by 2020 and 2030. “Relying on voluntary measures will not be enough. If binding rules to limit polluting farm practice aren’t put in place as soon as possible and farmers aren’t made to comply, we will have a major blind spot.” said Kate Nield at Client Earth. A spokesperson for the Department for Environment, Food and Rural Affairs said, “Our clean air strategy sets out for the first time how we plan to tackle farm ammonia pollution by requiring and supporting farmers to invest in the infrastructure and equipment required to reduce emissions.”

Adapted from *The Guardian Online*, 18 June 2019

Extract 4: Extreme water stress affects a quarter of the world's population

A quarter of the world’s population across 17 countries are living in regions of extremely high water stress, a measure of the level of competition over water resources, a new report reveals. “We’re currently facing a global water crisis. Our populations and economies are growing and demanding more water. But our supply is threatened by climate change, water waste and pollution.” said Betsy Otto, Global Director at Water Resources Institute.

The level of water stress in India, a country of more than 1.3 billion people, was striking, experts noted. In July, taps in the southern city of Chennai ran dry and satellite photographs showing an empty lake in the city went viral on social media. Although the US did not have high levels of water stress overall, a handful of states – including New Mexico and California – were found to be facing significant strains on their water supplies that will only intensify with global heating. Around the world, stress on water supplies can exacerbate conflict and migration, threaten food supplies and pose risks for water-dependent industries, including mining and manufacturing.

Adapted from *The Guardian*, 6 August 2019

Extract 5: Protecting Singapore from rising sea levels could cost $100 billion

Climate change is causing rising sea levels and floods in Singapore. Protecting Singapore against rising sea levels could cost S$100 billion or more over 100 years, Prime Minister Lee of Singapore said on Sunday, as the low-lying island-state makes preparations to mitigate the impact of global warming. Working on climate change defences should be done steadily over the years and several generations and should be treated like the Singapore Armed Forces. Prime Minister Lee said Singapore’s future options include building polders, areas of land reclaimed from a body of water, or reclaiming a series of islands offshore and connecting them with barrages.

Adapted from *Reuters*, 18 August 2019

Extract 6: Low price of water worsens water shortage

55% of California’s population lives in 16 coastal counties that border the Pacific. Yet for years, California suffered a terrible water shortage problem. In a world where the technology for treating ocean water exists, coastal cities would theoretically never have water shortage issue. So why didn’t California turn to the ocean around them for water when their freshwater sources dried up? The answer can be found in the price of water. Water is cheap. Drinking water that is sourced from freshwater sources, like rivers and lakes is cheap. Water that is sourced from oceans is more expensive to treat. Freshwater sources usually do not require any special processes to remove the salt content. Treatment is relatively simple, comprising of sedimentation and filtration

to remove solids and suspended materials. Treating seawater or any type of water with a relatively high salt content usually requires the use of complex desalination technologies that allow for the removal of salt. This translates to higher costs for desalination. So, while seawater might be abundant, it is not affordable at the current prices.

Source: *Water Online*, 29 January 2019, accessed on 18 Aug 2021

Extract 7: Rising water prices needed to reduce shortage

Prolonged droughts have led to shortage of water and rising water prices to encourage users to reduce consumption. At the same time, water prices have increased to encourage producers to shift to alternative water sources such as water processed through desalination. In Sub-Saharan Africa, Cape Town (South Africa) was forced to implement a 390% increase in water prices while limiting the maximum daily per capita water allowance to 50 litres. Water prices increased in Chennai (India) for the first time in 20 years due to rising labour costs and the costs of maintaining increasingly advanced water infrastructure including desalination and wastewater reuse plants. In Perth (Australia), the new Labour government implemented a punitive water tariff on the minority of users with high water consumption to promote water efficiency. In Western Europe and North America, the need to upgrade ageing infrastructure is a primary driver of increased water tariffs.

Source: *https://globalwatersecurity.org/content-hub*, accessed on 2 November 2019

Questions

(a) "Half-billion people are already living in places turning into desert, and soil is being lost between 10 and 100 times faster than it is forming." **[3]**

Using a diagram, explain how the above events may impact a country's PPC.

(b) Using a diagram, explain the impact of "poor harvest" and "rising urban population growth and income" on the market for food such as wheat. **[8]**

(c) Using the concept of opportunity cost, explain the effect of rising food prices on households in India. **[3]**

(d) (i) Using Extract 3, explain how the use of fertilisers in agriculture leads to market failure. **[6]**

(ii) Discuss whether the use of regulation is sufficient to solve the market failure in (d) (i). **[9]**

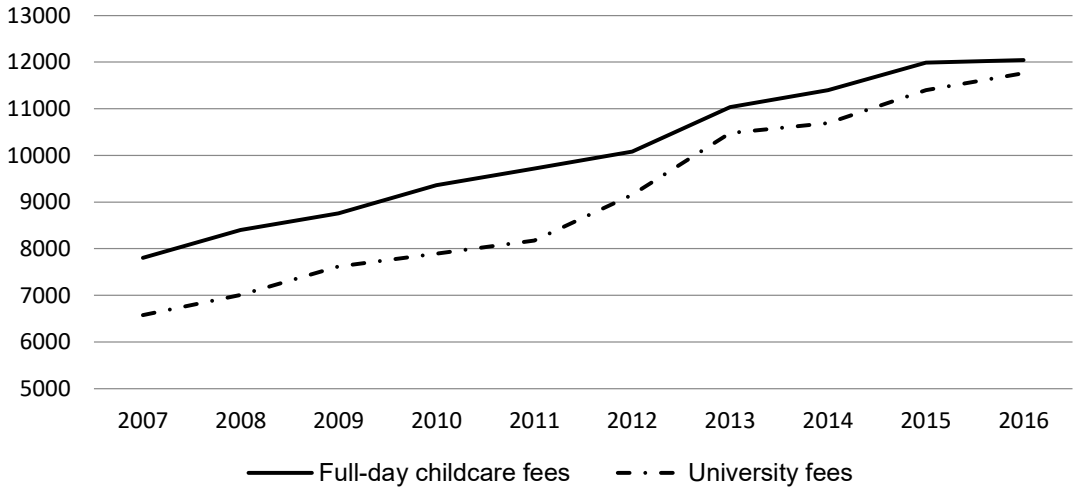
(e) Discuss whether governments should always rely on the price mechanism to allocate resources efficiently for goods and services such as flood control measures and water. **[12]**

[Total: 43 marks]

Question 3 [2017 TPJC H1 Promo]

Should Government Intervene in the Market for Education?

Figure 1: Full-day Childcare and University Fees in Singapore (S$ average per year)



Source: *Early Childhood Development Agency* and *ValuePenguin*

Extract 1: Early childhood education: Importance of learning through play

"Stop playing" must be one of the most common phrases used by parents to divert their children to what they believe to be more important or meaningful activities such as studying. However, parents and other caregivers for the young should not underestimate the importance of learning through play.

"Play engages children's attention in authentic, hands-on tasks," says Dr Robyn Anderson, a lecturer in Early Childhood and Education. Some lessons learnt on the playground and in early education settings — such as pre-schools and kindergartens — include sharing, playing fair, not hitting one another and putting things back where they were found. Such social skills, positive behaviours and values can help a person through life. "Concepts are understood and qualities are developed that are the same required to succeed in school and life, such as thinking, problem solving and communicating," she adds. Countries with successful long-term educational outcomes such as Finland and Canada have employed the play-based approach.

In its curriculum framework for kindergartens, the Ministry of Education talks about purposeful play where teachers intentionally plan the play experiences and organise the environment to enhance learning. Prime Minister Lee Hsien Loong, in his National Day Rally speech in 2012, said: "It is good for young children to play and to learn through play."

Source: *The Straits Times*, 4 April 2016

Extract 2: Putting a price on childcare: the costlier the better?

When it comes to childcare services, are pricier ones better? Experts said higher fees generally imply pre-school operators have more funds to offer better facilities and higher pay to attract more qualified teachers, but they added that parents should also consider other factors when looking for a quality centre. These include interactions between teachers and children, and the centres' engagement with parents.

Meanwhile, Preschool for Multiple Intelligences founder Khoo Kim Choo, who has been in the sector for more than 25 years, acknowledged that centres which charge low fees may still have good quality. This is because under the anchor and partner operator schemes, they get government grants but must keep fees low and have stricter quality requirements, she said.

There had been concerns that the childcare sector could have a "luxury good problem" in which parents perceive more expensive programmes to be better. In 2012, Mr Chan Chun Sing, then Acting Minister for Community Development, Youth and Sports, said: "We will need to help parents distinguish things that are important and core for a child's development and other things that are good to have."

One way for parents to do a background check is to visit the Child Care Link website, set up by the government, to check a centre's licence tenure. All centres have to be licensed, and the tenure can last 6, 12 or 24 months. Centres with a 24-month tenure are considered to have "exceeded" requirements.

Source: *The Straits Times*, 2 May 2016

Extract 3: Singapore university costs rise since 2007

Singaporean university students who are feeling the pinch have good reason, according to new research. The cost of attending university in the city-state has jumped 38 percent on average since 2007, the Singapore arm of ValuePenguin, a consumer research firm in New York, told CNBC. Official data showed that Singaporeans are spending more on higher education despite the opening of more universities and courses. The government's Household Expenditure Survey found that Singaporean families spent more than S$1 billion on university tuition in 2014, compared to S$650 million a decade earlier.

The head of Asia at ValuePenguin told CNBC that increased labour costs in Singapore could have been a factor in the big jump in university costs, but added that that didn't paint the entire picture. According to data from the Singapore Government, the percentage of applicants who won places on publicly-funded degree courses increased to 32 percent in 2015, from 25 percent in 2007. Not only that, the number of enrolled students at NUS, NTU and SMU have more or less grown in line with population growth. A student who plans to study history at NUS or NTU said: "Even though the fees have risen, I will still apply. Singapore universities are reputable and to study at a local university is a privilege."

Sources: *The Straits Times*, 4 April 2015 and CNBC, 12 October 2016

Extract 4: Is education a public good or a private good?

People with a university education earn more than others, but their higher earnings do not reflect the whole of their contribution. Others who work with them earn higher wages because of the added flexibility, innovation, and productivity of the labour force. People with a university education tend to be more active citizens, with their volunteering and other activities benefiting those around them. There are more new products and services for all of us to enjoy because of the contributions of university graduates. So the benefits of higher education are shared by the participants and the rest of society. It would be inefficient not to subsidise universities and their students. People would under-invest in their own education if they had to pay the full cost, because they would not choose to foot the bill for the benefits shared by all member of the society.

As a result, government may have an interest in funding education. However, this is not a sufficient argument for government to operate schools. Since education fails both parts of the public good definition, the free rider problem does not exist, and we do not need the government to operate schools. If government is not necessary for the operation of schools, we should not promote policies towards that end.

Sources: *The Chronicle of Higher Education*, 18 January 2011 and Foundation for Economic Education, 26 January 2017

Questions

(a) With reference to Figure 1, compare the full-day childcare and university fees in Singapore between 2007 and 2016. **[2]**

(b) What is the main characteristic of a positive economic statement? Identify **one** example of such a statement from Extract 4. **[2]**

(c) With reference to Extract 3, and using a supply and demand diagram, explain how the combination of increased labour costs and population growth is likely to have affected the market for university education over time. **[6]**

(d) **(i)** Define price elasticity of demand. **[1]**

(ii) With reference to Figure 1 and Extract 3, and using the concept of price elasticity of demand, explain why household expenditure on university education in Singapore has increased. **[4]**

(e) Extract 2 and 4 mentioned the use of government subsidies in the market for education. Explain the factors for consideration the government might use to decide on the extent of subsidies to provide. **[4]**

(f) Explain why there is a need for government intervention in the markets for public goods, and comment on whether you believe government intervention should be confined to public goods. **[8]**

(g) **(i)** With reference to Extract 1 and 4, state and explain **one** possible reason why economic efficiency is not achieved in the market for education. **[6]**

(ii) Using evidence from the case study and/or your own knowledge, discuss the view that Singapore government can best achieve economic efficiency in the market for education by providing subsidies. **[12]**

[Total: 45 marks]

Question 4 [2021 EJC H1 Prelim]

The battery is ready to power the world

Extract 1: The Electric Vehicle (EV) revolution

The EV revolution is well under way. Norway ambitiously heads toward having all new cars sold as zero-emission by 2025. China continues to be one of the major drivers of EV boom. The United States market is experiencing strong growth, driven first by models from Tesla and followed by other brands such as Chevrolet and Nissan. The United Kingdom and France have announced they would ban new petrol-powered vehicle sales by 2040.

Globally, the growth of the EV market is mainly attributed to factors such as supportive government policies and regulations promoting the adoption of EVs, increasing investments by leading automobile firms, rising environmental concerns regarding automotive emissions, and the decreasing prices of batteries. In particular, industrial experts have pointed out the effects of increased investments by firms, both on increasing the number of players in the market and enabling consumers to have a wider range of models to choose from.

EVs are generally well regarded by governments. Switching to EV means less air pollution-related illness, and therefore substantial savings in health care costs. To fight global warming, governments have implemented different policies to stimulate consumer demand.

Norway

A stellar example of a country that's fully charged to go electric is Norway. It has the highest number of EVs per person in the world, with close to 300,000 registered units in its EV fleet in 2018. According to the European Alternative Fuel Observatory, almost 50% of the cars purchased in Norway in 2018 are electric.

What lies behind such impressive result that puts Norway ahead of others? Answer seems clear: change of consumer habits through comprehensive incentive package introduced gradually since the 1990s. One of the key policies is Norwegian car-taxation system, based on the principle that the more you pollute, the more you pay. Tax for a new car is calculated in a way that makes big cars with high emissions very expensive. Such a comprehensive tax system, leveraging on the use of technology to cut administrative costs often faced by governments around the world, has allowed Norway to experience success in the push for EV.

Australia

Australia is far behind the world in the shift to electric mobility, and with the federal government only now stating it will take its commitment to the Paris Climate Agreement seriously, Australia has a lot of catching up to do. Work around managing the transition towards electric cars has been marred by inaction despite high-level support for electric cars from some among the current government. Many blamed the delay in the shift to the “unnecessary bureaucracy” in the government.

The division at a federal level has so far meant little has been done to introduce a cohesive plan or national strategy, leaving state governments, local authorities and industry to go it alone amid a lack of resources, limited authority and deep uncertainty.

Source: *Various*

Extract 2: Strong growth expected in Electric Vehicle (EV) charging stations

The number of EV charging stations continue to surge worldwide. ChargePoint, which manages a network of EV charging locations worldwide, has pledged to build 2½ million public charging stations by 2025, with roughly half of those in North America and half in Europe.

"I think we're at a huge tipping point here. This growth in EVs and charging infrastructure is going to continue," ChargePoint CEO Pasquale Romano said during a conference call with reporters. This expansion in provision of charging stations has contributed significantly to the increased adoption of EVs.

ChargePoint has raised some $300 million to move forward with the plan to expand the charging network, both in North America and Europe, according to Romano. Business owners would pay ChargePoint for installing charging stations in their parking lots and would recoup their costs by charging drivers a fee for using the charging stations.

As countries forge ahead to encourage the adoption of EVs, there is a need to bear in mind that while charging speed is important, availability is even more crucial as owners often need to wait for vacant charging stations in these areas. As such, there is a need to:

- improve drivers' access to charging stations as a whole; and also
- install more rapid chargers on strategic road networks; as well as
- add charging capability at car parks where people spend longer periods, such as at shopping and leisure centre car parks.

Source: *Various*

Extract 3: Are Electric Vehicles (EV) really better for the environment?

Since the first modern EV took to the roads in the 2000s, critics have been quick to question the 'clean' label attached to them. From manufacturing concerns to battery power sources as well as overall autonomy, EVs have been under scrutiny from sceptics. With the amount of debate and misinformation troubling the waters, the facts behind the efficiency of EVs have become somewhat clouded - so just how clean are these vehicles?

An argument that is routinely put forward to contrast the clean image of EVs is the pollution behind the manufacturing process which involves the production of the batteries. There is indeed a range of rare earth metals that make up the composition of the battery, and their extraction and manipulation can contribute to carbon emissions. However, as a 2018 International Council on Clean Transportation (ICTT) report illustrates, EV production might be more damaging than petrol-powered vehicles: EV production produces up to 60% more carbon dioxide than petrol-powered vehicles.

However, it is widely recognised that EVs are responsible for considerably lower emissions over their lifetime than vehicles running on fossil fuels, regardless of the source that generates the electricity.

A thorough assessment by the government is therefore required to ensure that any type of intervention will result in the "right" number of EVs on the roads. The ability to do so varies across countries due to different levels of information gap.

Source: *James Ellsmoor, Forbes, 20 May 2019*

Questions

(a) Using a production possibility curve diagram, explain the concepts of scarcity, choice and increasing opportunity cost faced by a car producer when deciding to produce more electric vehicles (EVs) over petrol-powered vehicles. **[7]**

(b) (i) Explain why the price elasticity of demand for EVs is negative. **[2]**

(ii) Explain how the demand for EVs by Tesla is likely to change over time. **[3]**

(c) The increase in number of EVs is due to free market forces rather than government intervention. **[10]**

Using demand and supply analysis, discuss the validity of this view.

(d) State the microeconomic objectives of a government. **[2]**

(e) Explain **two** reasons why public charging stations are not considered public goods. **[4]**

(f) (i) 'Government interference with the freely operating market mechanism for EVs stem from the externalities arising from its consumption rather than production.' **[10]**

Discuss the extent to which this is a valid assertion.

(ii) With reference to Extracts 1 and 3, explain two reasons how government intervention might introduce further inefficiencies into the market and comment on how these inefficiencies might differ for different economies. **[7]**

[Total: 45 marks]

Question 5 [2021 DHS H1 Prelim]

Current Issues in Food Retailing and Production

Table 1: Estimates of price elasticity of demand for selected grocery items in U.S.

	Price elasticity of demand
Milk	-0.10
Eggs	-0.24
Beef	-0.70
Frozen foods	-1.05

Source: *United States Department of Agriculture*, 2019

Extract 1: Retail food prices projected to rise

Food prices are on their way up at the grocery store in 2019, according to projections by the U.S. Department of Agriculture (USDA). It was reported that prices for factors of production may influence retail food prices. Electricity and diesel costs, as well as many other costs associated with food production, transport, and retail sales, are expected to rise, placing upward pressure on prices.

U.S. egg production and domestic consumption are both at all-time highs. U.S. domestic egg consumption has increased 16% over the past 20 years, up to 289 eggs per capita. Egg consumption is expected to rise as studies have shown that consuming more eggs, an affordable source of high quality protein and other nutrients, is not associated with increased risk of coronary heart disease or stroke. While eggs on their own are extremely popular to eat, they are also an input in a host of other foods and sauces such as mayonnaise. Eggs are a staple food around the world, and generally one of the most inexpensive protein sources, although egg prices are among the most volatile retail food prices due to changes in seasonal demand, with prices rising around holidays such as Easter, Thanksgiving and Christmas.

The main price driver in the egg industry is feed costs, primarily corn. A major avian influenza outbreak impacted egg-laying hens back in 2015. Production levels dropped and took a few years to normalise as flock sizes recovered. Egg prices have experienced increased volatility, one of the contributing factors include halting production in many facilities due to avian influenza outbreaks.

Source: *Supermarket News*, 3 January 2019,
Farm Progress, 16 April 2019, and *IHS Markit*, last modified 13 February 2021

Extract 2: FDA Targets Trans Fats and Officially Bans PHOs from Foods

The U.S. Food and Drug Administration (FDA) has announced that partially hydrogenated oils (PHOs) — the most widely used artificial trans fat — pose too much of a health risk to be used as an ingredient in foods. Food manufacturers were to remove all PHOs from their foods in order to be compliant with the new FDA ruling. Consumption of PHOs is linked to coronary heart disease and thousands of fatal heart attacks each year, according to the FDA. Removing PHOs from processed foods could prevent as many as 20,000 additional heart attacks and up to 7,000 additional coronary deaths each year.

Walk down any grocery store aisle and one will find PHOs in baked goods, crackers, margarine, pastries. PHOs can also be found in frozen foods, coffee creamers and refrigerated dough used for biscuits and cinnamon rolls. Their main use is to help keep processed food shelf stable —

essentially, to increase how long the food can sit on a supermarket shelf or refrigerator or freezer case without spoiling.

Since 2006, there had been increased education on how artificial trans fats could cause harm. U.S. companies were also required to list trans fats on their nutrition facts information. However, when a food that has less than 0.5 grams of trans fats the company can declare their food "trans-fat free". While the PHO ban will help to considerably lower the occurrence of trans fats in foods, there is no way to completely avoid them because they occur naturally in dairy, meat and also show up in smaller amounts in oils that are considered safe to consume.

Source: *Non-Communicable Disease Alliance*, May 2019 and *www.endocrineweb.com*, last updated 3 March 2019

Extract 3: Singapore to introduce a ban on PHOs

The Ministry of Health (MOH) will introduce a ban on partially hydrogenated oils (PHOs) as an ingredient in all foods, including fats, oils, and pre-packaged foods sold in Singapore, whether manufactured locally or imported. The ban will take effect from June 2021, to allow the industry time to reformulate their products or find new product sources. Food manufacturers are required to ensure that PHOs are not used in their manufacturing process, while retailers and importers are required to ensure that their range of products does not include PHO as an ingredient. All food manufacturers, retailers and importers will continue to be mandated to list the ingredients on the packaging of their products sold in Singapore. Market surveillance by MOH will be conducted regularly to ensure the industry's compliance to the ban.

Source: *Ministry of Health*, 6 June 2019

Extract 4: Singapore's Case launches price comparison app for groceries

A new free mobile app by the Consumers Association of Singapore (Case) aims to help consumers stretch their dollar by allowing them to compare prices of groceries. Price Kaki, to be rolled out this month, will compile prices provided by partner businesses as well as shoppers. Consumers can earn rewards for contributing information on in-store retail prices and promotions they come across. Users of the app can search for an item, find the retailer offering the lowest price and be alerted to price changes. The crowdsourcing app empowers consumers to share and more easily access price information. For a start, about 3,000 frequently purchased grocery items such as milk, rice and eggs will be listed on Price Kaki, using price information refreshed daily by FairPrice, Giant, Sheng Siong and Prime Supermarket. Case said it will work with the supermarkets to ensure that the information is up to date.

Source: *The Straits Times*, 10 September 2019

Extract 5: Singapore aims to produce 30% of its nutritional needs by 2030

The Singapore Food Agency (SFA) has set the target of producing 30 per cent of Singapore's nutritional needs by 2030. Known as "30by30", it is a move targeted at improving food security. Singapore currently imports over 90 per cent of its food supply and is exposed to the volatilities of the global food market. These volatilities include sudden disruptions to transport routes, export bans and the impacts of climate change. As such, Singapore needs to significantly ramp up its efforts in making the country more food self-sufficient.

SFA's ambitious "30by30" goal is to be met within Singapore's land constraints, with less than 1% being designated for agricultural use. There are four ways the target can be achieved: using technology to grow more with less, unlocking physical spaces for farming, developing local talent and getting consumers to support local. The use of technology in farming allows the development of resource-efficient, climate-resilient and high-yield agricultural solutions. High-tech, controlled

environment local production will be expanded further, and environmental sustainability of food production will be prioritised.

SFA will continue to support farmers through building capability, providing technical support and encouraging technology transfer. Farms can continue to tap the S$63 million Agriculture Productivity Fund (APF) to co-fund systems that better control environmental variables and boost production capabilities. These include systems that shade crops and minimise the negative impact of high temperatures on crop growth.

Singapore-farmed fish, eggs and vegetables could appear in more shopping carts here next year, as a campaign on the 'Singapore Food Story' to encourage Singaporeans to grow and eat local produce kicks off. The campaign to boost the profile of locally grown produce was timely, to ensure that the increase in supply of food grown here had a market. There were multi-fold benefits to eating food grown locally. Produce may be fresher with shorter time from farm to table. Certain items such as fruit may also be more nutritious when harvested ripe. Buying vegetables grown locally would have a lower carbon footprint than vegetables grown in Malaysia, for example.

Sources: *Various*

Questions

(a) With reference to the data in Table 1,

(i) Explain two possible reasons why the price elasticity of demand (PED) of milk and frozen foods differ. **[4]**

(ii) Explain how the producers' total revenue from milk and frozen foods would be impacted differently given an increase in their prices. **[4]**

(b) With reference to the data where appropriate, discuss whether supply factors or demand factors are likely to be more important in explaining the projected rise in the retail prices of eggs in the U.S. (Extract 1). **[8]**

(c) **(i)** Explain how market failure arises from consumption of foods with partially hydrogenated oils (PHOs). **[5]**

(ii) Discuss whether governments should rely solely on a ban to correct the market failure in c(i). **[9]**

(d) Explain the characteristics of a public good, and why the mobile app by Case (Extract 4) cannot be considered as one. **[5]**

(e) Discuss the case for Singapore to pursue its "30by30" target despite the possible constraints. **[10]**

[Total: 45 marks]

Question 6 [2022 MI H1 Promo]

Intervention in the market for healthcare

Table 1: Healthcare Expenditure Per Capita (US$) for Singapore and United States

Country	2014	2015	2016	2017	2018	2019
Singapore	2,206.11	2,302.60	2,476.17	2,625.00	2,667.67	2,632.71
United States	8,939.40	9,392.07	9,775.00	10,103.09	10,515.32	10,921.01

Source: *The World Bank*, 10 September 2022

Extract 1: Why health budgets must not be cut amidst political and economic turmoil

In the current global situation, characterised by political and economic uncertainty, high energy costs, labour shortages and the rising cost of living, many government finance ministers around the world face difficult choices as they seek to balance their books while meeting other calls on their budgets, including defence. This makes it all the more important to protect and, where possible, to increase health budgets to safeguard our populations and ensure that our health systems are resilient to inevitable future challenges. Failure to do so means we learned little from the COVID-19 pandemic.

We must invest now to prepare our health systems for future crises, focusing on some of those elements that have historically attracted fewer resources, such as public health and primary and mental healthcare, especially for those who are least likely to seek healthcare and least able to pay for services. Given that healthcare will always be labour intensive, even if we can harness new technology, we must invest in the health workforce, with measures that attract and retain these essential workers.

Source: *World Economic Forum*, 7 September 2022

Extract 2: Minimum wage increase for healthcare worker in private sector

In June, the Los Angeles City Council voted to approve the minimum wage hike for workers at privately owned hospitals, including nursing assistants, housekeepers, clerical workers, guards, janitors and other employees who are not supervisors or managers. The measure also covers privately owned dialysis clinics and nursing facilities associated with private hospitals.

The minimum wage hike is backed by the Service Employees International Union-United Healthcare Workers West (SEIU-UHW) which claimed that increasing the healthcare minimum wage from $16.06 to $25 per hour would allow workers to provide for their families, especially with historic inflation and sky-high gas prices, and help stop the burnout that has led to staffing shortages.

Hospital groups and other healthcare facilities are fighting the measure, arguing it could affect patient care and lead to planned improvements not moving forward and potential closures. As a result, vulnerable people may lose access to essential health services. One of the hospitals that has sued the city over the measure is Barlow Respiratory Hospital, which said that it “may very well cease to exist” if required to hike wages to $25 an hour, the LA Times reported.

Source: *Human Resources Director*, 4 August 2022

Extract 3: Critical for S'pore to unlock 'longevity dividend' as people live longer

A 100-year human lifespan may well become the norm in developed countries as life expectancy continues to increase. Yet, loneliness is a growing concern - the number of elderly people living

alone has doubled to more than 60,000 in the past decade, compared to over 30,000 in 2012. These trends mean that societies and individuals need to find ways to fund these longer lives, and to take a holistic approach to promote the well-being of the elderly, said Deputy Prime Minister and Coordinating Minister for Economic Policies Heng Swee Keat.

In order to better unleash the potential of people to contribute as they age, "it is critical that we unlock the 'longevity dividend', which will in turn benefit people of all ages and societies around the globe", said Mr Heng. "Research has found that older people in multi-generational teams tend to boost the productivity of those around them, and such mixed teams perform better than single-generation ones," noted Mr Heng. "I am hopeful that in the years ahead, we will be able to tap on the full potential of seniors to contribute to our communities," he said.

This longevity dividend is possible with healthy ageing and Singapore has managed to make some progress on this front with healthy years going up from 66.6 years in 1990 to 73.9 years in 2019. Getting people to stay healthy for longer is an ongoing effort and more needs to be done to alleviate the stresses around the last years of life, said Mr Heng. He added that health is about physical, mental and social well-being: "Our aspiration is that even seniors with physical or cognitive frailty should have the confidence to continue to go out and lead active lives."

Source: *The Straits Times*, 25 August 2022

Extract 4: Diabetes rising among young people in Singapore

A recently released study found that young people here aged 35 and below are less aware of diabetes and its symptoms, compared with people who are older. This is even though diabetes is rising among the young, including teenagers. Doctors tell The Straits Times that Type 2 diabetes, usually more common in people above the age of 40, is now increasingly diagnosed among teens, as a result of sedentary lifestyles and unhealthy diets.

Many young people are unfamiliar with the symptoms of diabetes, according to a study by several public health institutions in Singapore. The study found that people aged between 18 and 34 tend to be less knowledgeable about diabetes. Dr Sue Anne Toh, chief executive, medical director and senior consultant endocrinologist at specialist clinic and health technology company Novi Health, says younger people might not be as aware of the symptoms of diabetes as it is more common among older adults. Dr Toh also observes that young people may have "a bit of an invincibility attitude", which could be why they do not recognise the symptoms of diabetes. The symptoms include being hungrier and thirstier than usual, having to urinate more often, losing weight despite eating more, blurred vision and slow-healing wounds or frequent infections. But the condition can also be present with no symptoms in the early stages, which underscores the importance of regular screening for diabetes, say doctors.

Source: *The Straits Times*, 8 June 2021

Extract 5: Healthier SG initiative

As part of a new strategy to drive preventive healthcare for Singapore citizens, those who enrol with a family doctor could get fully subsidised recommended health screenings and vaccinations. The Healthier SG initiative, which aims to have citizens take charge of their own healthcare, involves having residents enrol with a single doctor, either a general practitioner (GP) or a polyclinic doctor, who will support residents in their health needs throughout their lives.

Under the plan, residents who enrol in Healthier SG - which is voluntary - can schedule a face-to-face onboarding health consultation, which will be paid for by the Government. Residents will then develop health plans with their doctors, who will continue to monitor the resident's progress via follow-ups. Health plans will include an overview of the resident's health status, medical needs and health goals and will be followed by an action plan, such as lifestyle adjustments or weight management.

The move is the latest in a series of measures to keep healthcare costs from increasing further while still meeting the needs of an ageing population. With healthcare expenditure expected to triple in the coming decade to almost $60 billion a year by 2030, Health Minister Ong Ye Kung said it will make a huge difference if chronic illness like diabetes can be prevented or delayed. Mr Ong noted that the Government is spending a lot on healthcare, by investing in infrastructure and in recruiting and retaining doctors, nurses and other healthcare workers to run them. Shifting the healthcare system's focus from the reactive treatment of diseases when they surface to a more preventive one that relies on regular screenings would enable hospitals here to focus on complex conditions and emergency cases, while reducing healthcare expenditure.

Source: *CNA*, 21 September 2022

Questions

(a) With reference to Table 1, compare the healthcare expenditure per capita for Singapore and United States over the period 2014-2019. **[2]**

(b) Using Extract 1 and a diagram, explain one effect of an increase in health budget on the production possibility curve. **[3]**

(c) **(i)** Using a demand and supply diagram, explain the likely consequences of an increase in minimum wage from $16.06 to $25 on the private healthcare labour market. **[4]**

(ii) Using Extract 2 and price elasticity of demand, explain the impact of the wage revision on hospitals' expenditure on labour. **[3]**

(d) Explain whether healthcare is a public good. **[4]**

(e) Using Extract 5, explain the reasons for the rise in price of healthcare services in Singapore and comment on whether the rise in price is likely to continue in future. **[6]**

(f) **(i)** Using Extracts 3 and 4, assess whether positive externalities is the main reason for government intervention in health screening. **[8]**

(ii) Discuss whether fully subsidising recommended health screenings is the best policy that the Singapore government should adopt to address the issues raised above. **[10]**

[Total: 40 marks]

Additional Question 1 [EJC 2019 H1 Promo]

Going Car-lite

Table 1: Selected Statistics of Singapore

Year	MRT Rail Length (km)	Expressway (km)	Private Cars Population	Population Size (million)
2012	148.9	161	617,507	5.31
2017	199.6	164	612,256	5.61

Source: *Singstat*, accessed on 20 August 2019

Table 2: MRT fares for commuters travelling from Jurong East Station to Bishan Station

Commuter Group	Peak hour rail fare	Off-peak rail fare
Adult	$1.61	$1.11

Source: *Public Transport Council*, accessed on 26 August 2019

Extract 1: Singapore to halt vehicle population growth from 2017

Tackling traffic congestion is a major challenge for governments worldwide and Singapore is no exception. Singapore, one of the world's most expensive places to own a car, will not allow any growth in its car population from February, citing the small city-state's land scarcity and billions of dollars in planned public transport investments. The Land Transport Authority (LTA) said it was cutting the permissible vehicle growth rate in the city-state to 0 per cent from the current 0.25 per cent per annum for cars and motorcycles.

Singapore, whose total population has risen nearly 40 per cent since 2000 to about 5.6 million now, counted more than 600,000 private and rental cars on its roads as of last year.

Singapore has added new routes and capacity in its bus network. The government will continue to invest S$20 billion in new rail infrastructure, S$4 billion to renew, upgrade and expand rail operating assets over the next five years.

Source: *Reuters*, 23 October 2017

Extract 2: Getting Singaporeans to embrace a car-lite society

It is a common misconception that car-lite means car-less or car-free. It only means drastically reducing car usage to an optimal level by substituting it for public bicycles, personal mobility devices and even walking.

Due to land constraints and competing needs, there is limited scope for further expansion of the road network. Roads now make up about 12 per cent of land use, almost the same as housing. The LTA spelled out a 15-year plan for the Republic to reduce its reliance on cars and move towards public transport by expanding the rail transport network and piloting a car-sharing scheme to allow residents convenient access to such vehicles without needing to own one.

What will it take for Singaporeans to give up their cars?

Attitude will take some time to change. There is no denying that the car offers freedom of travel - when to, where to and how to in the fastest way. Many prefer the comfort of a car, which some perceived to be an extension of their home with the privacy it affords. However, the average

number of persons in a private car on our roads is less than two, compared with about 80 in a packed bus.

Unlike other cities, Singapore has not given the car free rein. There are disincentives to the widespread use of the car, including Electronic Road Pricing charges and high parking rates. Car growth has also been managed by the vehicle quota system. In that sense, there has always been the intention to prevent the car from dominating the transport scene.

A longer-term game changer will be the autonomous vehicles, which can provide travel on demand with comparable comfort, and thus represent a compelling reason for motorists to give up their cars.

Source: Today Online, 18 November 2017

Extract 3: Developing Autonomous Vehicles

An autonomous vehicle (AV) is capable of sensing its environment and moving safely with little or no human input. These AVs combine a variety of sensors to perceive their surroundings, such as radar and sonar. Advanced control systems interpret sensory information to identify appropriate navigate paths, as well as obstacles and relevant signage.

Driving safety experts predict that once driverless technology has been fully developed, it will reduce traffic collisions caused by human error, such as delayed reaction time and other forms of distracted or aggressive driving. Additional advantages could include higher speed limits, smoother rides, increased roadway capacity and minimised traffic congestion, due to decreased need for safety gaps and higher speeds. Furthermore, AVs can take up to 10 passengers for a full load as compared to private cars which tends to be under-loaded. Currently, the LTA envisioned the AVs to be a shared service amongst commuters, rather than a one-to-one replacement for private cars. This means that AVs could potentially replace the need for cars across several households, hence reducing the number of cars on the road.

Additionally, AVs will be playing a big role in reducing travelling and waiting times for the future land transport system. These services can adjust their routes based on passenger demand, so that commuters can make fewer transfers, while optimising the resources of the transport network. When paired with AV technology, there is further potential to reduce operating and manpower costs. When this technology is ready, it can support Singapore land transport system with a greater variety of options for commuters.

AVs however, have difficulty operating in certain types of weather. Heavy rain interferes with roof-mounted laser sensors, and snow can interfere with cameras. Additionally, the road system and infrastructure would likely need major upgrades for driverless vehicles to operate on them. Traffic and street lights, for instance, would likely all need altering.

Source: Various

Questions

(a) With reference to Table 1, state the relationship between:

(i) MRT rail length and private cars population, and **[1]**

(ii) MRT rail length and population size. **[1]**

(b) In light of the above observation in a(i), explain the central economic problem faced by the government in allocating more resources to MRT rail. **[4]**

(c) Use a diagram to explain possible demand and supply factors which might have accounted for the change in the MRT usage, and comment on whether this **[9]**

change will be sustained in the long term.

(d) Assuming MRT is pursuing a revenue-raising strategy, explain how price elasticity of demand concept could be used to account for the difference in adult MRT fares as shown in Table 2. **[6]**

(e) Assess the determinants considered by a rational consumer in the decision to buy a private car in Singapore. **[8]**

(f) **(i)** With the aid of a diagram, explain why traffic congestion by private cars is likely to cause market failure. **[6]**

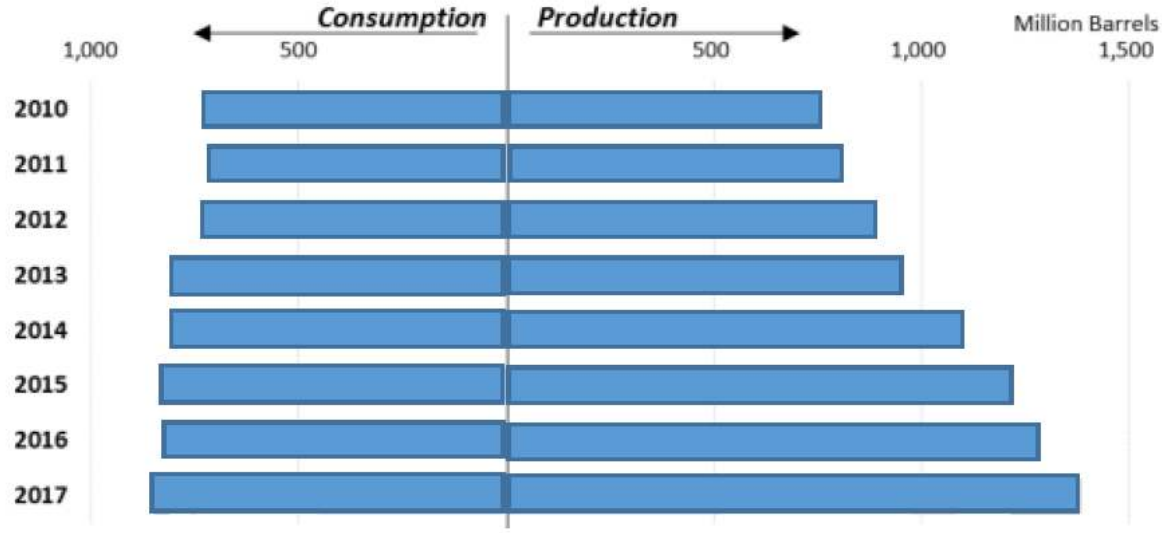
(ii) Assess whether cutting the permissible vehicle growth rate to zero per cent or replacing private cars with autonomous vehicles will better contribute towards a car-lite Singapore. **[10]**

[Total: 45 marks]

Additional Question 2 [RVHS 2019 H1 Promo]

Plastics and its impact

Figure 1: Consumption and Production of Natural Gas Liquids (NGLs)



Source: *U.S. Energy Information Administration*, 2018

Extract 1: Rise in bottled water

The demand for bottled drinks has contributed to the alarming increase in the demand for plastic packaging. The demand, equivalent to about 20,000 bottles being bought every second, is driven by an apparently great desire for bottled water and the spread of a western, urbanised "on the go" culture to China and the Asia Pacific region.

More than 480 billion plastic drinking bottles were sold in 2016 across the world, up from about 300 billion a decade ago. This could be due to a desire for healthy living and there are ongoing concerns about groundwater contamination and the quality of tap water, which all contribute to the increase in bottle water use.

Source: *The Guardian*, 28 June 2017

Extract 2: Investments in plastics plants in the US

In the US, fossil fuel and petrochemical companies are investing hundreds of billions of dollars to expand plastic production capacity. This includes new plastic "cracking" plants that will produce the raw material for plastic packaging.

The new plants – being built by corporations like Exxon Mobile Chemical and Shell Chemical – will help fuel a 40% rise in plastic production in the next decade, according to experts, exacerbating the plastic pollution crisis that scientist warn already risks "near permanent pollution of the earth."

The huge investment in plastic production has been driven by the shale gas boom in the US, fuelled by the revolution in shale gas technologies such as advancements in fracking and horizontal drilling, to produce Natural Gas Liquids (NGLs), which is an essential raw material in the production of plastics.

Source: The Guardian, 26 December 2017

Extract 3: The use of bio-based packaging

Plastic packaging comprises of both non-recyclable and recyclable or bio-based packaging. Non-recyclable packaging generates pollution and uses Natural Gas Liquids (NGLs), as well as other non-renewable resources. When it is discarded, it creates waste that can disrupt ecosystems and sit for hundreds of years. On the other hand, bio-based packaging comes from renewable materials and can be recycled, offering an alternative to non-recyclable products.

United States Department of Agriculture (USDA) has implemented a product certification scheme for bio-based packaging. Companies with bio-based packaging voluntarily submit their product information in order to qualify for a "USDA Certified Bio-based Product" label. Similar to the effect of positive product differentiation provided by other USDA labels, such as "USDA certified organic", qualifying for USDA's bio-based label promotes the increased sale of products derived from renewable resources. This can help companies to create a larger, more loyal consumer base as well. Companies that cater to consumers' sense of environmental responsibility have seen significant benefits in terms of their profits.

Source: *Medium.com*, 30 March 2017

Extract 4: Call for action to reduce harm of plastics

Environmental groups are demanding curbs on the production of plastic. Some argue that single-use plastic items should be banned.

EIA oceans campaigner Sarah Baulch called for global leadership and urgent action to tackle the problem. "Our marine wildlife is choking on an ever-growing tidal wave of plastics manufactured to be used once and almost instantly discarded, leaving a polluted legacy for our environment and future generations," she said.

Source: *The Herald*, 10 December 2017

Extract 5: Consumers' positive perception of bio-based packaging

Researchers found that many manufacturers and retailers are increasingly choosing drop-in bio-based packaging, which is chemically identical to the traditional packaging but made from renewable raw materials instead of Natural Gas Liquids (NGLs). Their research also shows that increasingly environmentally conscious consumers, too, prefer bio-based packaging over conventional packaging. This provides support for the likely success of encouraging consumption of bio-based packaging in dealing with the adverse impact of plastic packaging on the environment.

Since those materials are, however, not always easily distinguishable by consumers simply by the way they look or feel, the environmental benefits have to be communicated clearly by providing information, for example, on the renewable feedstock, bio-based content, or the reduction of greenhouse gas emissions.

Source: *European Bioplastics*, 29 January 2018

Extract 6: Excise tax on plastic packaging

Indonesia is the world's second-largest plastic waste producer, after China. It is estimated that each Indonesian individual consumes 700 plastic bags per year. This is why rivers are usually clogged with plastic and other trash, particularly in the bigger cities.

According to preliminary information from Indonesia's Finance Ministry, the excise tax will be imposed on all products wrapped in plastic packaging, including bottles, bags and sachets. However, lower rates may apply for those companies that focus on recycling activities and therefore cause less damage to the environment.

However, others claim that the new excise tax is not fair, and goes against a basic human right. In Indonesia's urban centers, people cannot drink water from the tap, while river water is highly polluted. As such, they are dependent on plastic-bottled water. Easy access to clean water (including a low sales price) is regarded a primary right of the people, and therefore some opponents of the excise tax request the government not to touch this segment.

Another issue is that plastic packaging has become a vital component in people's lives. Plastic is a cheap, relatively safe and long-lasting form of packaging for food products and beverages.

Business groups say the government should focus on the development of good public waste management systems that is accessible to everyone. It involves the collection, transportation, treatment and disposal of waste in public areas.

Source: *Indonesia Investments*, 25 July 2016

Questions

(a) With reference to Figure 1, explain the likely change in price of Natural Gas Liquids (NGLs) from 2010 to 2017. **[2]**

(b) (i) Using Extract 1, explain one demand factor that could account for the increase in consumption of plastic packaging. **[2]**

(ii) Using Extract 2 and with the help of a diagram, analyse how the demand factor might impact the market for plastic packaging. **[4]**

(c) Discuss how the product certification scheme in Extract 3 might incentivise firms to use bio-based packaging. **[8]**

(d) Consumers in Indonesia's urban centers rely on bottled water as water from the tap is unfit for consumption due to the heavily polluted water sources. **[2]**

Provide an economic justification to why the price of bottled water may be a concern to the government.

(e) Explain one likely opportunity cost of installing a public waste management system. **[2]**

(f) Extract 6 suggested developing good public waste management systems. **[7]**

Identify and explain the two characteristics of a 'public good' and comment on whether the public waste management system is considered a public good.

(g) (i) Explain the case for government intervention in the market for non-recyclable plastic packaging. **[6]**

(ii) Discuss whether imposing an excise tax is the best policy to achieve allocative efficiency in the consumption of non-recyclable plastic packaging. **[12]**

[Total: 45 marks]

Additional Question 3 [ASRJC 2023 H1 Prelims]

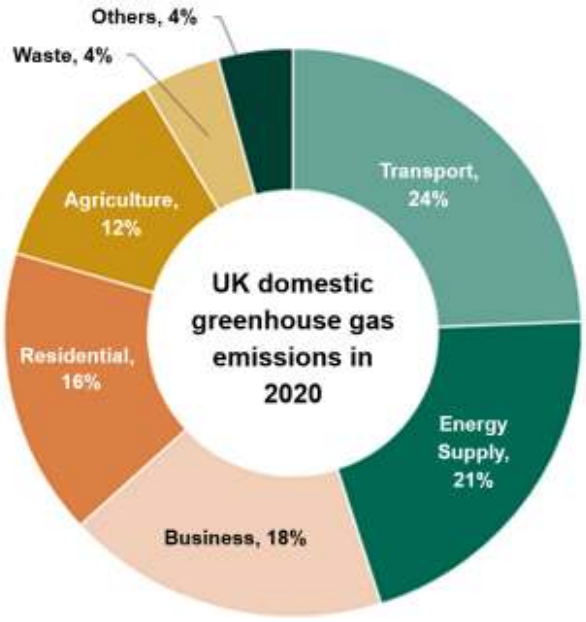
The Electric Vehicle and Energy Market

Table 1: Selected countries' share of electricity production from nuclear sources (%)

Country	2015	2016	2017	2018	2019	2020	2021	2022
France	76.22	72.17	71.64	71.71	70.53	67.11	68.93	63.30
United Kingdom	20.98	21.33	20.99	19.69	17.47	16.54	15.26	14.82
Germany	14.33	13.16	11.81	12.01	12.52	11.35	11.89	6.27
Japan	0.32	1.48	2.75	4.73	6.44	4.34	6.39	5.36

Source: Energy Institute Statistical Review of World Energy, accessed 19 July 2023

Figure 1: Greenhouse gas emissions by source in the UK, 2020 (%)



Source: www.gov.uk, accessed 19 July 2023

Extract 1: Electric vehicle sales reach new highs but knowledge gaps remain

Today's electric vehicles (EVs) are beyond anything nineteenth century drivers could imagine. From intelligent driving to proactive service and remote vehicle access, EVs can offer the safety and convenience today's consumers crave. With the rise in demand, EV sales in the United Kingdom (UK) are booming and traditional car manufacturers are ramping up their EV productions to meet the demand. With consumers aiming for a more sustainable future, it's not surprising that owning a car with lower carbon emissions has become desirable for many. This is great news in terms of addressing the underconsumption issue as EVs are expected to result in positive social benefits by way of reduced pollution emissions and because of the associated decrease in the consumption of gasoline that EV adoption would bring about. But environmental concerns are not the only reasons people give for wanting an EV; potential buyers also cited the benefits of fuel and cost savings. These factors are so appealing that intenders are willing to pay more for a new EV than they might for a conventionally fuelled equivalent.

However, there are still plenty of misunderstandings and false rumors about EVs, and the effect they have on vehicle sales is all too real. Half of potential buyers are still concerned about battery life and nearly a third also cite a lack of knowledge as a potential blocker for making a purchase, with 32% saying they do not understand the full benefits of purchasing an EV. For example, while the majority know that EVs run on electricity, some aren't so sure. Ford recently conducted an in-depth study on the public opinion of EVs and found that lack of knowledge is a major deterrent to purchasing. The study found that 90% of Americans and Europeans believe EVs have poor acceleration. However, the reality is that the Tesla Model S is the fastest accelerating sedan on the planet. Overall, besides the EV subsidies given by various governments across the world, the study has revealed a need for more education to help the public understand what EVs can and cannot do.

Sources: adapted from https://ibm.com, https://marketingweek.com and https://sciencedirect.com, accessed 19 July 2023

Extract 2: Japan plans to approve the building of nuclear power plants

As part of a big energy policy shift announced by Prime Minister Fumio Kishida, Japan plans to approve the building of nuclear power plants for the first time since the disaster at the Fukushima nuclear plant following the country's March 2011 earthquake and subsequent tsunami. The Ministry of Economy, Trade and Industry revealed details of the plans this week, saying they would also create a path for some reactors to remain in operation for more than 60 years. Nuclear power - considered one of the cleanest sources of electricity from a sustainability perspective - is likely to account for an increasing share of Japan's energy mix.

One feature of the new-generation plants is that they would be easier to run for short bursts or at reduced output. This would make them easier to use alongside renewable energy sources such as wind and solar power, which are dependent on weather and time of day. Japan's ability to develop renewable energy is limited by its relatively small available land and deep offshore waters. Reliance on coal to provide a stable power source clashes with the aim of reducing carbon emissions. This is why nuclear power - which combines a stable supply and low generation costs with decarbonization - is again becoming a feasible alternative. However, even before Japan builds new nuclear power plants, it needs to restart some existing facilities while dispelling doubts about their safety since the Fukushima accident.

Source: https://asia.nikkei.com, 29 November 2022

Extract 3: Germany has shut down its last three nuclear power plants, and some climate scientists are aghast

A collection of esteemed scientists, including two Nobel laureates and university professors, made a last-minute plea in an open letter on the nuclear advocacy group's website, *RePlaneteers*, to keep the reactors operating. "In view of the threat that climate change poses to life on our planet and the obvious energy crisis in which Germany and Europe find themselves due to the unavailability of Russian natural gas, which causes energy cost to soar, we call on you to continue operating the last remaining German nuclear power plants," the letter states. However, the open letter did not succeed in keeping the nuclear reactors open.

The German government says it is making the country safer by closing down the nuclear reactors. The nuclear phase-out makes Germany safer and avoids additional high-level radioactive waste. Volker Quaschning, a professor of renewable energy at the Hochschule für Technik und Wirtschaft Berlin, supports Germany closing its nuclear reactors because of the risk of an accident. "Nuclear energy is a risky technology. During the Chernobyl reactor accident, Germany was hit by radioactive fallout. A reactor accident would make large parts of Germany uninhabitable. In the course of global uncertainties, the risks for nuclear energy are also

increasing", Quaschning told CNBC. Also, radioactive waste management is "still unsolved in Germany as it is expensive, and no one in Germany wants a repository for highly radioactive waste near them."

Turning off the nuclear reactors opens the doors for renewables to be the future of energy, Niklas Höhne, a professor at Wageningen University, told CNBC. "In the German context, the phase-out of nuclear energy is good for the climate in the long term. It provides investment certainty for renewable energy; renewables will be much faster, cheaper and safer than expansion of nuclear energy," Höhne told CNBC. Nuclear energy is also often more expensive than wind and solar power, Quaschning said, adding, "there are no longer any real advantages with nuclear energy."

Source: https://cnbc.com, 18 April 2023

Extract 4: Government intervention in the market for fossil fuel

Fossil fuels subsidies

Globally, fossil fuel subsidies were $5.9 trillion or 6.8% of GDP in 2020 and are expected to increase to 7.4% of GDP in 2025 as the share of fuel consumption in emerging markets (where price gaps are generally larger) continues to climb. Subsidies are intended to protect consumers by keeping prices low, but they come at a high cost. Subsidies have sizable fiscal costs, promote inefficient allocation of an economy's resources and encourage pollution (contributing to climate change and premature deaths from local air pollution). Removing subsidies and using the revenue gain for better targeted social spending, reductions in inefficient taxes, and productive investments can promote sustainable and equitable outcomes.

Carbon taxes on fossil fuels

Carbon taxes are charges on the carbon content of fossil fuels. Their principal rationale is that they are generally an effective tool for meeting domestic emission mitigation commitments. Also, carbon taxes can generate significant domestic environmental benefits —for example, reductions in the number of people dying prematurely from exposure to local air pollution caused by fossil fuel combustion to generate power. Because these taxes increase the prices of fossil fuels, electricity, and general consumer products, they promote switching to lower-carbon fuels in power generation, conserving on energy use, and shifting to cleaner vehicles, among other things. A tax of, say, $35 a ton on carbon emissions in 2030 would typically increase prices for coal, electricity, and gasoline by about 100%, 25%, and 10%, respectively. Carbon taxes also provide a clear incentive for redirecting energy investment toward low-carbon technologies like renewable power plants.

Another important argument for carbon taxes is that they could raise a significant amount of tax revenue. Using this revenue productively to benefit a country's economy could help offset the harmful macroeconomic effects - reduced employment and investment - of higher energy prices. For advanced economies, for example, the revenue might be used mostly to cut taxes on labour and capital income, implying a revising of the tax system rather than an increase in the overall tax burden. For developing countries unable to mobilise adequate revenue from broader taxes because of low economic activities, carbon tax revenues might be used mostly to fund investments for achieving sustainable growth. In all countries, use of some revenues to fund clean-energy infrastructure upfront could enhance carbon pricing's effectiveness and credibility.

Sources: https://imf.org/, December 2019

Questions

(a) With reference to Table 1, compare the share of electricity production from nuclear sources in Japan with that in other countries from 2015 to 2022. [3]

(b) The price mechanism allocates scarce resources in the free market through signalling, incentive and rationing functions.

With the change in demand for electric vehicles (EVs) mentioned in Extract 1, explain how the price mechanism is able to perform any two of its functions in the EV market. [5]

(c) **(i)** With reference to the data, explain and comment on two reasons that resulted in the underconsumption of EVs from society's perspective expressed in Extract 1. [6]

(ii) Using a diagram, explain how EV subsidies can improve resource allocation when positive externailities exist. [4]

(d) Explain how the building of nuclear power plants in Japan will result in changes in the supply curve of nuclear energy. [4]

(e) Using Extracts 2 and 3, discuss the factors that are likely to influence a government's decision to follow Japan's plan "to approve the building of nuclear power plants". [8]

(f) Extract 4 suggests that some countries subsidise the consumption of fossil fuels while other countries impose tax on carbon content of fossil fuels.

In view of efficiency and equity, discuss whether government intervention in the fossil fuel market does more harm than good. [10]

[Total: 40]