YISHUN INNOVA JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION
Higher 1

CANDIDATE NAME	
CG	INDEX NO

ECONOMICS **8843/01**

Paper 1 **23 August 2024**

Case Study Questions **3 hour**

Additional Materials: Writing Papers
Cover Pages

READ THESE INSTRUCTIONS FIRST

Write your name, CG and index number on the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid/tape.

There are **two** questions in this paper. Answer **all** questions.
Start **each question** (not each part) on a **fresh piece of writing paper**.

At the end of the examination, fasten your work for each question **separately**.

The number of marks is given in brackets [ ] at the end of each question or part question.

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Answer **all** questions.

Question 1: Electricity Market

Table 1: Electricity consumption by sector (in Gigawatt hours)

	2018	2019	2020	2021	2022
Household	7231.5	7681.3	8244.5	8277.7	7911
Industrial-related	21439.8	21463.9	20978.9	22293.1	22693.9

Source: Energy Market Authority, 1 June 2023

Extract 1: Rise in electricity prices

Electricity prices will go up in Singapore as a result of higher carbon tax, a scheduled increase in the goods and services tax (GST) and rising energy costs. “The carbon tax is part of a suite of measures to support Singapore’s transition to a low-carbon economy, by steering consumers and producers away from carbon-intensive goods and services, holding businesses accountable for their emissions, and enhancing the business case for the development of low-carbon solutions,” said Energy Market Authority’s (EMA) spokesman. Power generation companies levied the carbon tax are expected to pass on some of the cost to electricity retailers like SP Group, which could then pass on these additional costs to customers. Dr David Broadstock, senior research lead for energy transition at the National University of Singapore said the rising cost from the carbon tax could encourage innovation among companies to reduce the carbon content of the fuel used. At the same time, having more clean energy imports in the future could also have a bearing on the influence of carbon tax on future electricity prices, he added.

Around 95 per cent of Singapore’s electricity comes from imported natural gas, which means Singapore cannot be fully insulated from developments in the global energy market. EMA said that natural gas which is the cleanest form of fossil fuel will remain the country’s main source of energy for the next decade, accounting for more than 50 per cent of Singapore’s energy mix by 2035, even as the Republic turns to cleaner technology to decarbonise the energy sector. Dr Broadstock expects global natural gas prices to continue to rise over the next three to four years due to geopolitical uncertainties like the Israeli-Hamas conflict affecting energy supply chains.

Source: The Straits Times, 29 Dec 2023

Extract 2: **More generation capacity needed to meet Singapore’s growing electricity demand**

Singapore will need more generation capacity to meet the growing demand for electricity, largely due to new investments in energy-intensive sectors such as advanced manufacturing and data centers, as more businesses digitalise and more artificial intelligence services are rolled out.

The growth of data center activity is at odds with Singapore's environmental goals due to the huge amounts of energy required to cool data centers.

The tech industry is estimated to be responsible for up to 4 per cent of global greenhouse gas emissions, and this figure is sure to grow rapidly amid the rising use of data storage and processing. Singapore's digital economy contributes to almost a fifth of its gross domestic product.

Source: The Straits Times, 30 May 2024

Extract 3: Singapore's energy transition towards a net-zero future

Power generation accounts for about 40% of Singapore's emissions today. The price we all pay for electricity generally does not reflect the "true costs" of producing it. To decarbonise our power sector, we will be importing electricity from the region and exploring low-carbon alternatives such as hydrogen. Hydrogen is often held up as a potential clean fuel of the future, because it can be burned like oil or gas but releases no climate-warming carbon dioxide – only water.

The Singapore government will set up a Future Energy Fund to support infrastructure investments for our energy transition towards a net-zero future. Net zero refers to the balance between the amount of greenhouse gas that's produced and the amount that's removed from the atmosphere. It can be achieved through a combination of emission reduction and emission removal. Examples of energy transition infrastructure which could be supported by the Future Energy Fund include undersea cables to import low-carbon electricity as well as new hydrogen terminals and pipelines. These projects may involve nascent technologies or require high upfront capital expenditures, and furthermore exposed to significant commercial and geopolitical risks. The establishment of the Future Energy Fund ensures that the Government is ready to provide financial support to catalyse energy transition projects to secure low-carbon energy supplies to meet Singapore's decarbonisation ambitions. This will better prepare our businesses and economy for a low-carbon future and allow Singapore to remain an attractive investment destination.

Source: Energy Market Authority, 1 March 2024

Questions

(a) With reference to Table 1, compare the change in electricity consumption between household and industrial-related sectors from 2018 to 2022. [2]

Suggested answer:
Similarity [1]:
- Both household and industrial-related sectors showed an increase in electricity consumption from 2018 to 2022.

Any of the differences below can be accepted [1]:
- The electricity consumption of households increases at a faster rate than industrial-related sector.
- The electricity consumption of households increases while the electricity consumption of industrial-related sector decreases from 2019 to 2020.
- The electricity consumption of households decreases while the electricity consumption of industrial-related sector increases from 2021 to 2022.

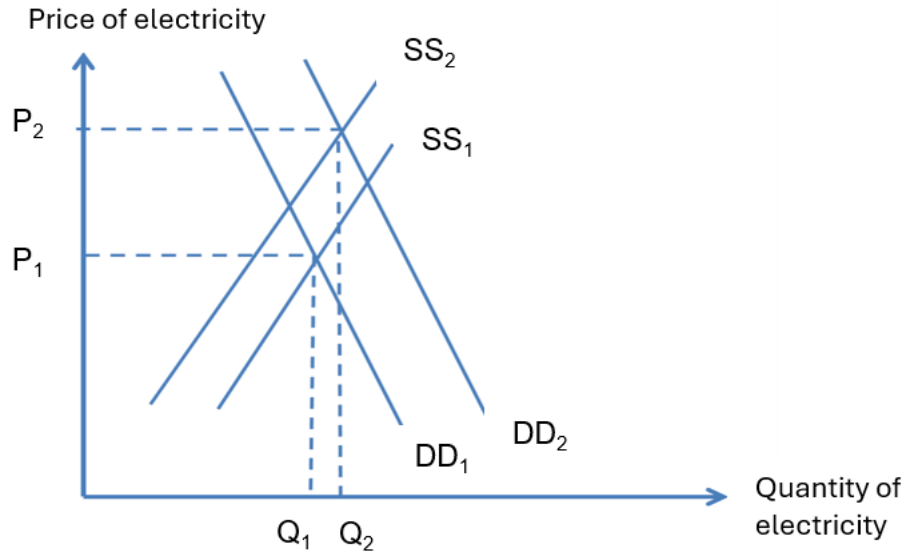
(b) (i) With the use of a demand and supply diagram, account for the increase in electricity price and comment on whether it will continue in the future. [8]

Suggested answer:

Explain the demand factor (2m):
- From Extract 2: As more businesses digitalise and more artificial intelligence services are rolled out, there's new investments in energy-intensive sectors such as advanced manufacturing and data centers. Since huge amounts of energy required to cool data centers, the growth of data center activity suggests an increase in demand for electricity from DD_1 to DD_2.

Explain the supply factor (2m):
- From Extract 1: Higher carbon tax, the rise in GST and rising energy cost → increase in unit cost of production of electricity → fall in unit profitability → producers are less willing and able to supply electricity → fall in supply of electricity from SS_1 to SS_2.

Diagram (1m)



Explain the price adjustment process (1m):

- At the prevailing price P_1, Qdd > Qss → shortage occurs → upward pressure on price

Any logical comment (2m):

- From Extract 2, EMA said that natural gas will remain the country's main source of energy for the next decade and global natural gas prices is expected to continue to rise over the next three to four years due to geopolitical uncertainties like the Israeli-Hamas conflict affecting energy supply chains → rise in expected cost of generating electricity → electricity price is expected to continue to rise in future

(ii) Explain how the opportunity cost differs for households and producers of goods and services given an increase in electricity price. [6]

Suggested answer:

Explain how increased electricity price leads to increased electrical consumption expenditure (2m):

- The demand for electricity is price inelastic as it is a key factor input used in the production of goods and services. The increase in electricity price will lead to a less than proportionate fall in quantity demanded → rise in electricity consumption expenditure

Explain the opportunity cost faced by households (2m):

- Assume the amount of income unchanged, more income is spent on electricity → less income is available to spend on next best alternative e.g. dining in restaurants → households forgo the satisfaction of dining in restaurants

Explain the opportunity cost faced by producers of goods and services (2m):

- Assume the amount of funds unchanged, more funds are spent on electricity → less funds are available to spend on next best

alternative e.g. conduct R&D to improve quality of products → firms forgo the amount of potential revenue that could be earned from selling better quality products

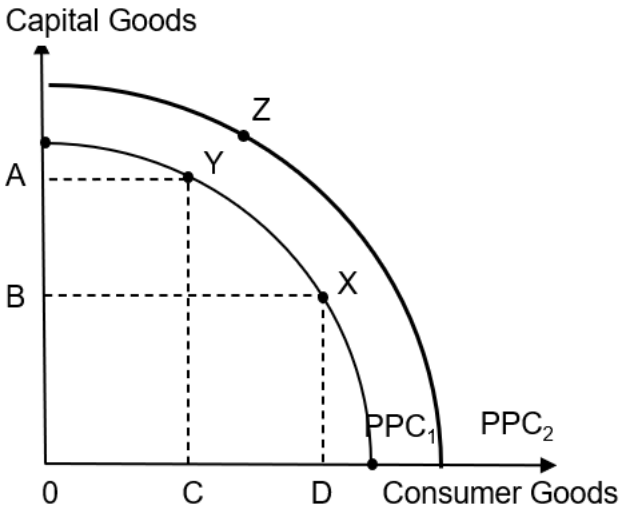
(c) Using a Production Possibility Curve, explain how the establishment of Future Energy Fund by the Singapore government can affect its current and future living standards. [6]

Suggested answer:

Explain impact on current material SOL (3m with reference to diagram):
- Assuming economy is currently at full employment and producing at Point X. The establishment of Future Energy Fund to support energy transition infrastructure such as undersea cables and new hydrogen terminals and pipelines would suggest a movement from Point X to Point Y on PPC_1 where CD amount of consumer goods are given up to increase production of capital goods by AB.
- With less consumer goods produced, less goods and services are available to consumers resulting in a decrease in current material SOL.

Explain impact on future material SOL (3m with reference to diagram):
- Investment in more capital goods now → increase in productive capacity of the country leading to potential economic growth → outward shift of the PPC from PPC_1 to PPC_2.
- The economy could thus increase its output from previously point Y on PPC_1 to point Z on PPC_2 → increases production of consumer goods available for consumption in the future → future material SOL increases.

Students can also explain impact on future non-material SOL:
- When the establishment of Future Energy Fund is successful in catalysing energy transition projects to secure low-carbon energy supplies, there will be lesser carbon emissions in the future → cleaner environment to live in → increases the future non-material SOL



(d) Explain why electricity is not likely to be a public good. [4]

Suggested answer:

Explain why electricity is excludable (2m):

- It is possible to prevent someone from using it if they did not paid for it. Utilities can measure the amount of electricity consumed and send consumers their bills. Those who do not pay can have their service disconnected.

Explain why electricity is rivalrous (2m):

- When one person consumes electricity, which is finite in nature, it reduces the amount of electricity available for others.

(e) Explain why "the price we all pay for electricity generally does not reflect the "true costs" of producing it" as mentioned in Extract 3. [4]

Producers only take into account MPB and MPC and ignore MEC (1m)

Explain presence of MEC, in the context of electricity production, where carbon is emitted into the environment and contribute to climate change/ respiratory health problems. (1m)

Link to divergence between MPC and MSC (1m)

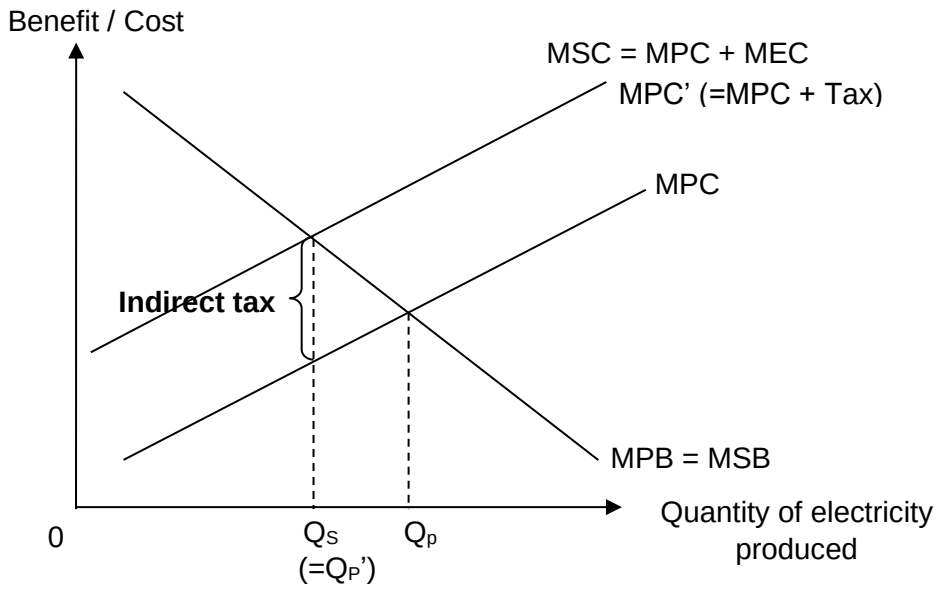
The price that we pay for electricity (based on free market equilibrium determined by MPC (supply) & MPB (demand) is less than the true cost of producing it, MPC+MEC. (1m)

(f) Discuss whether the use of carbon tax is the best policy to support Singapore's energy transition to a net-zero future. [10]

Policy 1: Tax

Carton tax is a form of indirect tax imposed on producers for the production and sale of the electricity

With reference diagram below, by imposing a per-unit carbon tax that is equal to MEC at $0Q_S$, the tax has the same effect as increasing the marginal private cost of production (unit COP rises). The tax that targets to internalize the marginal external cost will equate to the MEC. Thus, the tax shifts the respective agent's MPC vertically upwards by the full amount of MEC to coincide with MSC. This is illustrated by MPC + tax. The new private optimal output level where MPC' equates to MPB is now at $0Q_P$', which coincides with $0Q_S$. This means that producers will now decrease production to the socially optimal level $0Q_S$. Thus, allocative efficiency is attained when DWL is eliminated and allow Singapore's energy transition to a net-zero future.



Limitation

Explain limitation due to imperfect information by government in estimating MEC, may over/undertax. Undertax, while able to raise MPC, but will not reduce production to optimal quantity, deadweight loss while reduced, not eliminated.

Also, this is a global pollution problem and the efforts of some countries to tackle the market failure will not be enough. The effectiveness of carbon tax to resolve the market failure requires the rest of the world to do their part.

Policy 2:

Set up Future Energy Fund to support infrastructure investments for our energy transition towards a net-zero future. Examples like building undersea cables to import low-carbon electricity into Singapore, as well as new hydrogen terminals and pipelines where electricity with lower carbon emission can be produced. Thus, lower in reducing the MEC of electricity production and reduce DWL, allow Singapore's energy transition to a net-zero future.

Alternatively, explain how the Future Energy Fund acts as a subsidy to the production of low-carbon electricity which will reduce the cost of production. Producers find low-carbon electricity relatively cheaper to produce and switch production method to produce low-carbon electricity. This also means the production of higher carbon electricity is now relatively costly, leading to a fall in production of higher carbon electricity towards socially optimal level $0Q_S$. Thus, allocative efficiency is attained when DWL is eliminated and allow Singapore's energy transition to a net-zero future.

Limitation

Building undersea cables, hydrogen terminals and pipelines may involve nascent technologies which can be costly and unstable, thus require high upfront capital expenditures which can straining on government budget. Unstable energy source may be less reliable, as such consumers of electricity might not be willing to switch over from the use of the traditional, more pollutive form of electricity.

Conclusion

Tax, compared to Future Energy Fund, can be a better policy as not only that it does not require the government to spend, it actually allows the government to collect tax revenue instead. As producers of electricity needs to bear the tax from carbon emission, it will also incentivize them to cut down carbon emission by innovating into cleaner methods of production or using cleaner inputs to produce electricity. Tax revenue collected can also be used to subsidise such efforts or to finance for the Future Energy Fund, further facilitating Singapore's energy transition to a net-zero future.

Levels 2 (4-7 marks)
For a well-developed answer that explains tax and an alternative measure in achieving efficient allocation of resources for the market of electricity, facilitating Singapore's energy transition to a net-zero future.

Levels 1 (1-3 marks)
For an under-developed answer that that explains tax and an alternative measure in achieving efficient allocation of resources for the market of electricity, facilitating Singapore's energy transition to a net-zero future.

Evaluation (1-3 marks)

Up to 3 marks for a relevant comment on which policy is the best/better in facilitating Singapore's energy transition to a net-zero future.

Suggested mark scheme:

Annotation	**Level**	**Mark out of 10**
C	L2	4
C + C or D	L2	5
D + C	L2	6
D + D	L2	7

[Total: 40]

[Turn over

Question 2: Japan's economic challenges and the road ahead

Table 2: Economic indicators for Japan

	2018	2019	2020	2021	2022
Real GDP Growth (annual %)	0.6	-0.4	-4.1	2.6	1.0
Consumer Prices (annual %)	1.0	0.5	0.0	-0.2	2.5
Total Unemployment Rate (% of total labour force)	2.5	2.4	2.8	2.6	2.6
Final Private Consumption Expenditure (current US$ in Trillions)	3.75	3.81	3.79	3.77	3.28

Source: data.worldbank.org, 18 June 2024

Table 3: Economic indicators for USA

	2018	2019	2020	2021	2022
Real GDP Growth (annual %)	3.0	2.5	-2.2	5.8	1.9
Consumer Prices (annual %)	2.4	1.8	1.2	4.7	8
Total Unemployment Rate (% of total labour force)	3.9	3.7	8.1	5.3	3.6
Final Private Consumption Expenditure (current US$ in Trillions)	16.8	17.4	17.4	19.4	21.1

Source: data.worldbank.org, 18 June 2024

Extract 4: Performance of the Japanese economy in 2022

Japan's moderate growth, lower inflation, and structural challenges positioned it uniquely among the G7. While the United States experienced higher growth rates, driven by strong consumer demand and substantial fiscal stimulus, Japan's growth was modest.

In 2022, Japan's economic outlook was influenced by a combination of factors such as a gradual recovery from the COVID-19 pandemic and persistent structural challenges. Tokyo lifted restrictions on economic activity more gradually. This delayed the post-pandemic increase in demand that many other countries have seen. Domestic demand in Japan is weak and this is partly a result of low wages.

Source: weforum.org 6 October 2022

Extract 5: Why Japan Stands Virtually Alone in Keeping Interest Rates Ultralow

As the Federal Reserve has repeatedly pushed up American interest rates to tame rampant inflation, virtually every major central bank in the world has scrambled to keep up the pace. In the United States — where the economic recovery has been rapid and wages are rising apace — the Fed is seeking to squash inflation by throttling demand.

However, the Bank of Japan has remained steadfastly committed to its ultralow interest rates, arguing that making money more expensive now would only suppress already weak demand and set back a fragile economic recovery from the pandemic. The Bank of Japan's governor, Haruhiko Kuroda, made clear in comments to Parliament that the bank would not change course anytime soon stating that "under the current economic conditions, it's appropriate to continue monetary easing.

Weak consumer demand has made officials at Japan's central bank wary of raising interest rates. A rate increase could also make it more difficult for Japan to service its own gargantuan debt. The debt concerns have become even more salient as the government has provided enormous fiscal support to businesses and households to counteract the economic damage from recent world events. "Fiscal policy and monetary policy are joined at the hip, and that's what's making it so difficult for the Bank of Japan to make a move," said Saori Katada, an expert on Japanese financial policy at the University of Southern California.

Impact on Yen

The diverging economic circumstances in the United States and Japan have led to drastically different monetary policies, a gap that has helped drive down the yen as investors seek better returns elsewhere. The yen is in free fall.

Consequently, while inflation pressures in the United States have been broadly distributed, in Japan they have primarily hit essentials like food and energy, for which demand is satisfied largely through imports.

The weak yen has presented a difficult messaging problem for the Japanese government. The currency's depreciation has contributed to tidy profits for export-heavy companies like Toyota, whose products have become cheaper for consumers overseas. It is also expected that the cheap yen would draw international tourists, who started to return after a nearly three-year absence caused by Japan's tough pandemic border restrictions. But the currency's weakness has been a drag on the finances of households and smaller businesses and could have a damaging effect on public sentiment, said Gene Park, a professor of political science at Loyola Marymount University in Los Angeles who studies Japan's monetary policy.

It's unclear whether raising interest rates would even arrest the yen's plunge. Rate increases by other central banks have done little to protect their own currencies against the muscular dollar.

Source: The New York Times, 21 October 2022

Table 4: Percentage of Japan General Government Gross Debt to GDP

2018	2019	2020	2021	2022
232.3	236.3	259.4	262.5	263.9

Source: tradingeconomics.com/japan/government-debt-to-gdp, accessed 30 July 2024

Extract 6: Fiscal Prudence and Structural Reforms Needed to Secure Sustained Post-Pandemic Growth

The Japanese economy is confronted with several structural challenges including weakening fiscal discipline, side effects from prolonged monetary easing, and demographic drag from population aging and low fertility rates, which contributed to labor shortages, lagging productivity and competition as well as increased social security spending. Additionally, behind Japan's sluggish growth is stagnating wages that have left households reluctant to spend. At the same time, businesses have been invested heavily in faster growing economies overseas instead of in the aging and shrinking home market.

In addition, Japan's debt swelled, reflecting its heavy reliance on borrowing to meet spending needs to fight the COVID-19 pandemic. There is an urgent need for Japan to restore its fiscal health, the worst among developed countries, to avoid high debt servicing costs and low confidence in the economy.

Priority should be given to rebuild fiscal buffers by containing social security expenditure while raising tax revenues in the post-pandemic period. Credible fiscal consolidations to ensure long-term fiscal sustainability can help lower funding costs, improve fiscal headroom and financial stability. Nonetheless, fiscal policy should remain supportive of the economy in the short term, with targeted measures to hard-hit sectors, backed by a credible medium-term fiscal consolidation plan. Rather than provide universal supports to all households, it is more critical to roll out well-targeted spending measures for vulnerable households and hard-hit businesses in the services sector to enhance the efficacy of the stimulus packages, given the tight fiscal situation.

Additionally, comprehensive structural reforms should be quickened to address Japan's long-term challenges. Japan must also improve the human capital of their young populations, especially as the rest of the country is aging rapidly. Digitalisation should also be accelerated while immigration is one option for solving Japan's labor shortage problem. The country, however, has been relatively unaccepting of foreign labor, except for temporary stays. On the other hand, artificial intelligence also gives hope for boosting productivity. Robotics, another option, are gradually being deployed but not to the extent they can fully make up for the lack of workers.

Source: apnews.com, 16 February 2024
and: amro-asia.org, 9 March 2022

(a) **(i)** Using **two** indicators from Tables 2 and 3, what can you conclude about living standards between Japan and US in 2022? Comment on the effectiveness of these indicators as a measure of living standards. [6]

(ii) Using AD/AS analysis, account for the difference in Real GDP Growth rates between Japan and US in 2022. [2]

(b) With reference to Extract 5, explain why the Bank of Japan "has remained steadfastly committed to its ultralow interest rates" while the Federal Reserve "pushed up American interest rates". [6]

(c) Extract 5 states that "the weak yen has presented a difficult messaging problem for the Japanese government".

Explain the likely impact of a weak yen on the

i) export heavy companies like Toyota. [3]

ii) Japanese households. [3]

(d) **(i)** Extract 6 states that "Japan's debt reached a record 1,286.45 trillion yen ($8.6 trillion) at the end of 2023."

Explain one possible reason for Japan's swelling debt. [2]

(ii) "Priority should be given to rebuild fiscal buffers by containing social security expenditure while raising tax revenues in the post-pandemic period."

Discuss the factors that the Japanese government should consider when deciding to "rebuild fiscal buffers" in the post-pandemic period. [8]

(e) Discuss whether fiscal policy or supply side policies could best help Japan to secure sustained post-pandemic growth. [10]

[Total: 40]

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