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# 2022 Taiwanese Economics Olympiad

Preliminary – Round 2: Application of Economics and Finance

## Question Booklet

**Time** Saturday, March 5, 2022, 13:00 to 16:00 (180 minutes)

**Location** Taipei Fuhsing Private School, Taipei *or*  
Kaohsiung Station No. 1 Venue, Kaohsiung

### Instructions

- Fill in your contestant number in the boxes at the top.
- Use only a blue or black pen or pencil.
- **Choose at least one problem from each section. Solve no more than 4 problems out of 6.**
- Do all rough work in the question booklet.

### Information

- This is an individual-based round.
- If you provide solutions for 5 or 6 problems, all of them will be graded, but only 4 will add to your result. If you do not specify which to grade, only the lowest 4 grades will be included in the result.
- If not stated otherwise, consider all goods, services, and assets infinitely divisible.
- Numbers of firms and people may be only integers.
- Convey your ideas clearly. Do not skip important logical transitions in your reasoning.
- Take care of handwriting. If you strike something out, it will not be graded.
- You may leave the examination venue more than 60 minutes after this round begins.

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## SECTION 1

### Problem 1 GDP and earnings in Taiwan


In 2021, the year-on-year growth rate of Taiwan's GDP exceeded 6%, with the same figure per capita surpassing US\$30,000. If purchasing power parity (PPP) was taken into account, Taiwan's GDP per capita could reach around US\$60,000 in the same year. Nevertheless, a lot of Taiwanese complained that such economic statistics differed from their day-to-day experience.

According to Taiwan's Employee Earnings Survey, the median annual earnings of 2020 was NT\$501,000 (approximately US\$16,700) among roughly 8 million surveyed employees.\* Compared with 2012, the median earnings among all employees only increased by 13.35%, whereas the GDP per capita increased by 33.1% over the 8 years. With regard to the monthly average earnings of surveyed Taiwanese employees in the same year, the figure was NT\$54,160 (US\$1,805), which was 17.46% higher than 8 years earlier and likewise much slower than the GDP growth over the same time.

\*The total population of Taiwan was 23.65 million in 2020.

#### Questions

- (a) (5 pts) **Explain** why Taiwan's GDP per capita rises by a factor of 2 when PPP is taken into account.
- (b) (5 pts) **Explain** why discrepancies are found between the mean and median of employees' earnings as well as between the growth rates of both figures.
- (c) (10 pts) **Indicate** possible factors that result in a big gap between the growth rates of employees' earnings and Taiwan's GDP.
- (d) (10 pts) **Discuss** possible long-term problems in Taiwan's economy if such a growth gap persists.

 by a factor of  $n$  為原本的  $n$  倍



## Problem 2 Swing timers

To reduce fights among kids over playing on swings in parks, the municipal government of Taipei installed timers in 6 parks and experimented with the “friendly sharing scheme” that limited a single use of a swing to 3 minutes. This policy went so viral that the government had to elucidate the new idea publicly.

“Swings are the most popular facilities in parks. It has come to our notice that many kids are not willing to give them up, so we’ve decided to install timers at some swings—as a kid starts playing, he or she just activates the countdown device as a reminder of yielding the swing to the next kid waiting in line when time’s up.

### Questions

- (a) (5 pts) **Analyze** the characteristics of swings and discuss why the government thinks “many kids are not willing to give them up.”
- (b) (5 pts) **Share and explain your opinion** on whether the phenomenon that “many kids are not willing to give them up” exists in reality.
- (c) (10 pts) **Discuss** whether you agree to the policy of installing timers at specific recreation facilities.
- (d) (10 pts) Whether you agree to the policy, **indicate** another solution to the swing problem and discuss its effectiveness.



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## SECTION 2


### Problem 3 Dumping and antidumping

Though the second largest economy in the World Trade Organization (WTO), China has been labeled a “non-market economy” ever since its entry in 2001. With such a status, Chinese exports are more likely to be considered dumping and penalized with punitive tariffs. The Chinese government agreed on the US-supported “non-market economy” clause during its application for admission to the WTO, but it also demanded that there be a sunset clause for the status in 15 years.

In January 2018, the US imposed tariffs of 30% and 50% on the exports of washing machines and solar products from China after investigation. Later in February, the US imposed an antidumping duty of 109.95% on cast iron drainage fittings, as well as another antidumping duty of 106.09% and a countervailing duty of 80.97% on aluminum foil goods from China. Such duties foreshadowed trade war between the two superpowers at a later time.

#### Questions

- (a) (5 pts) **Define** the term “non-market economy.”
- (b) (5 pts) **Indicate** how a country may classify imports as dumping.
- (c) (10 pts) **Discuss** how dumping can affect market demand, supply, and social surplus in importing and exporting countries respectively.
- (d) (10 pts) **Discuss** whether “dumping” and “antidumping measures” are against the concept of a free market.

 punitive 懲罰性的
duty 稅
cast iron drainage fittings 鑄鐵污水管道配件
countervailing 反補貼的
foreshadow 成為……的前兆



## Problem 4 Solar tax in Spain


Spain has long taken the lead in the development of solar power in the world. Aspiring to expand the use of solar power, the Spanish government introduced a lavish subsidy program in 2007.

In the program, anyone who installed solar panels and sold generated power back to the electricity network would receive a subsidy of €463 per MWh (megawatt hour). In contrast, if energy was generated by coal, only a subsidy of €43 would be paid for electricity sold back to the energy network. In other words, the price of solar power purchase is ten times that of coal-fired energy. As a result of generous government subsidies, the percentage of solar power in Spain increased by a factor of nearly 3 from 19% in 2006 to 54% in 2013.

However, the Spanish government launched a new bill in October 2015, covering a much stricter policy of solar power purchase. According to the new bill, those who generate and sell solar power back to the electricity network are supposed to pay electricity network fees. Besides, they are even taxed on the basis of maximum capacity of power generation plus real quantity of power generated for sale and personal use. What's more, the new "solar tax" policy is retroactive—anyone in breach of the new rule, regardless of the starting time of solar power generation, will be fined up to €60 million.

### Questions

- (a) (5 pts) **Explain** why the Spanish government chooses solar power as a dominant component of its renewable-energy mix.
- (b) (15 pts) **Discuss** why the Spanish government decided to tax solar power generation.
- (c) (10 pts) **Discuss** impacts on the renewable energy industry in the wake of the launch of the solar tax policy in Spain.

 lavish	豐厚的
megawatt	百萬瓦
retroactive	溯及既往的



## SECTION 3

### Problem 5 New convenience stores

In a small town without convenience stores, 200 residents live evenly along a 2-kilometer-long road ( $R$ ). Currently, two convenience store chains  $S$  and  $F$  are planning to open a new store respectively, and the two locations will open at the same time. They both hope to attract as many customers as possible. Residents on road  $R$  do not have any preference for both chains.

In this town, if a convenience store is  $d$  kilometers away from a resident's home, the utility of enjoying services there is  $1 - d^2$ . If a resident chooses to shop online, the utility is 0.51.

#### Questions

- (a) (10 pts) What are the Pareto optimal locations for  $S$  and  $F$  to open the two locations on road  $R$ ? What is the total utility of all 200 residents after the opening of both new locations at their Pareto optimal locations?
- (b) (10 pts) What are the Nash equilibrium locations for  $S$  and  $F$  to open the two locations on road  $R$ ? What is the total utility of all 200 residents after the opening of both new locations at their Nash equilibrium locations?
- (c) (10 pts) Why is the density of convenience stores high in a city (not necessarily the town in this problem)?



## Problem 6 Transportation policies in a city

In city T, there are 1,000 residents, and each of them owns a car. In the city, 200 public parking spaces are provided by the municipal government for free. As parking spaces are in short supply for most of the time, the government plans to take action to attain the equilibrium of the demand and supply of public parking spaces.

Given the utilities of a resident in different settings in the table below, answer the following questions.

	<b>Able to find a parking space</b>	<b>Unable to find a parking space</b>
<b>Driving a car</b>	0.9	0.1
<b>Taking public transportation</b>	0.4	0.3

### Questions

- (a) (5 pts) Suppose there are no restrictions on the use of private vehicles. How many residents will choose to drive?
- (b) (5 pts) Suppose the government intends to increase parking supply. How many parking spaces should the government add?
- (c) (10 pts) Suppose the government wishes to subsidize public transportation users by evenly distributing all parking fees, and that as a resident receives or pays  $p$  dollars, his or her utility will increase or decrease by  $\frac{p}{100}$ . How should the government price a single use of a parking space?
- (d) (10 pts) Discuss possible consequences in reality after implementing the two policies in problems (b) and (c).

**END OF QUESTIONS**