

# Principles of Microeconomics – Midterm [2021/11/12]

Note: You have 180 minutes (9:10am-12:10pm) to earn 168 points. Allocate your time wisely.

## Part A (50%): “S. Korean drivers panic buy urea after China tightens supply” (Reuters, 2021/11/5)<sup>1</sup>

...China's customs announcement last month of inspection certificates to ship fertiliser and related materials like urea, a type of nitrogen mainly used as a fertiliser in agriculture, was considered a de facto ban on exports to assure supplies in its domestic market. Prices of industrial urea in South Korea jumped more than 80% to \$483 per tonnes in September from October 2020, said the trade ministry. A barrel of urea solution that used to cost 10,000 won (\$8.45) per 10 litre was now traded at as much as 120,000 won on online second-hand markets, local media reports said...

## Excerpts of “Seoul looking to tap into industrial urea stockpile for diesel cars” (Korea Herald, 2021/11/4)<sup>2</sup>

In Seoul and major cities across the country, diesel exhaust fluid (DEF), without which diesel trucks cannot run, is in short supply, triggering fears for disruptions in cargo delivery. There is due to be a sharp drop in urea imports from China, which supplies more than 60 percent of the chemical in Korea. In an emergency measure, the government verified the stockpile of technical-grade urea, held by steel, power generation and cement companies. It expects that the urea can be made into DEF for vehicles as early as next week, if the Ministry of Environment clears the move after a review of safety and technological issues...

## Excerpts of “China to ship 18,700 tons of urea to South Korea” (2021/11/10)<sup>3</sup>

Urea, the main ingredient in a fluid used in diesel vehicles and factories to cut emissions, is usually made using coal. Since China effectively restricted exports of urea Korea has been grappling with a dire shortage, and many fear the tight supply could escalate into a major transportation and logistics crisis. Korea imports all of its urea from overseas, with China accounting for 97 percent.

### Answer the following questions:

1. How does the de facto export ban on fertilisers affect the Chinese urea market?
  - a. (8%) Draw a supply and demand diagram to analyze the effect on equilibrium price and quantity, as well as the amount of imports or exports.
  - b. (8%) What is the effect on consumer surplus, producer surplus and total surplus? Do the gains from banning exports outweigh the losses? Explain.
2. How much of Korean DEF-use urea is supplied by China?
  - a. (4%) Assuming all such supplies are banned, use the midpoint method to calculate the percentage change in quantity supplied of urea solution/DEF, as well as its percentage change in prices on Korean online second-hand markets.
  - b. (4%) Calculate the price elasticity of demand for urea solution/DEF in Korea. Is demand elastic or inelastic? Explain.
  - c. (4%) What assumptions are required for the above elasticity estimation? How would your estimates be biased if these assumptions were false?
3. How does China's export ban on urea affect the Korean urea solution/DEF market?
  - a. (8%) Draw a supply and demand diagram to analyze the effect on equilibrium price and quantity, as well as the amount of imports or exports.
  - b. (6%) What is the effect on consumer surplus, producer surplus and total surplus?

<sup>1</sup> By Sangmi Cha/Heekyong Yang: <https://www.reuters.com/world/china/skorean-drivers-panic-buy-urea-after-china-tightens-supply-2021-11-05/>

<sup>2</sup> By Hong Yoo: <http://www.koreaherald.com/common/newsprint.php?ud=20211104000724>

<sup>3</sup> By Ahn Sung-mi, Korea Herald: <http://www.koreaherald.com/view.php?ud=20211110000741>

- c. (8%) Draw a supply and demand diagram to analyze what making DEF with technical-grade urea does to equilibrium price and quantity, and the amount of imports or exports.

**Part B (56%): “Taiwan plans to introduce carbon pricing mechanism by 2023” (CNA, 2021/10/13)<sup>4</sup>**

Taipei, Oct. 13 (CNA) The head of Taiwan's Environmental Protection Administration (EPA) said Wednesday that the agency will design a carbon pricing mechanism to charge big emitters for carbon pollution, in compliance with the EU's new Carbon Bill, if the EPA's proposed amendment to the greenhouse gas act is approved in the next legislative session...(omitted)...The proposal plans to start by charging businesses with annual carbon emissions over 25,000 metric tons, which account for 80 percent of Taiwan's total carbon emissions. Small and medium enterprises will not be included in the early stage, but a rating system will be put into place in the future to help them reduce carbon emissions and mitigate their negative impact. The price range is yet to be decided...(omitted)...The EU's [Carbon Border Adjustment Mechanism (CBAM)], which was announced in July 2021 and starts trial projects in 2023, will initially only be applied to products with high risk of carbon leakage, including imported steel, aluminum, cement, fertilizer and electricity. Importers will be required to register the emission amount of imported products without paying any fees. After its official launch in 2026, importers will be required to purchase CBAM certificates from the EU as fees for the carbon emissions of imported products. However, fees will be waived if importers can prove to the EU that their products' carbon cost has been paid in the country of origin, according to the EPA's website.

**Answer the following questions:**

1. (2%) Does carbon emission generate positive or negative externalities? Explain.
2. Draw a supply and demand diagram to analyze the EU steel market.
  - a. (4%) Does the equilibrium quantity maximize social welfare? Why or why not?
  - b. (8%) How are consumer surplus, producer surplus, governmental revenue and total surplus affected when carbon emissions from steel production are taxed/subsidized the exact amount of the external cost/benefit?
  - c. (10%) How are consumer surplus, producer surplus, governmental revenue and total surplus affected if the tax/subsidy is only half the amount of the external cost/benefit? Is total surplus still larger than without the tax/subsidy? Explain.
3. How does the EU's new Carbon Bill affect the Taiwan's steel market? Assume that Taiwanese companies only export steel to the EU, if any.
  - a. (8%) Draw a supply and demand diagram to analyze the effect of the official launch of CBAM on equilibrium price and quantity, as well as the amount of imports or exports.
  - b. (8%) How are consumer surplus, producer surplus, governmental revenue and total surplus affected when carbon emissions from steel production are taxed?
  - c. (8%) Draw a supply and demand diagram to analyze how Taiwan imposing its own carbon tax on big steel companies (in response to CBAM) affects equilibrium price and quantity, as well as the amount of imports or exports.
  - d. (8%) How are consumer surplus, producer surplus and total surplus affected by Taiwan imposing its own carbon tax? Is the total surplus higher or lower than Taiwan not imposing its own carbon tax (and let companies pay fees to EU's CBAM)? Explain.

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<sup>4</sup> By Liang Pei-chi and Ken Wang: <https://focustaiwan.tw/politics/202110130014>

**Part C (32%): Notability blinks on charging users more, grandfathers in existing users (2021/11/3)<sup>5</sup>**

Notability developer Ginger Labs announced today that, in a change of heart, its popular note-taking app wouldn't eventually require current users to switch to a subscription model. This news comes just two days after the developer announced a new subscription model where current app owners who wanted to keep the same features would be forced to start a \$14.99 / year subscription (discounted to \$11.99 for a limited time) by November 1st, 2022.

Notability rolled back its original Monday pricing announcement and today posted an update on its company blog addressing current customers: "Everyone who purchased Notability prior to our switch to subscription on November 1st, 2021 will have lifetime access to all existing features and any content previously purchased in the app."

This means that current paid users will not have to pay for the new subscription plan after updating to the new 11.0 version. They also get to retain features that new free-tier users won't have access to, including iCloud sync, unlimited editing, and features purchased in the Notability shop.

**Answer the following questions:**

1. (4%) Suppose the price of Notability is \$14.99 for lifetime subscription, and they launch a new discount price for \$11.99. Which demand curve will increase consumer surplus more: An elastic or inelastic one? Explain.
2. (8%) Now the pricing of Notability is changed to annual subscription at \$14.99 per year. Draw a supply and demand diagram for the college student market of Notability, in which students expect to use this app for 4 years. How are equilibrium price and quantity, as well as consumer surplus affected?
3. Consider another well-known note-taking app, GoodNotes, and the Apple Pencil.
  - a. (4%) Are GoodNotes and Apple Pencil substitutes or complements of Notability, or neither? Explain.
  - b. (4%) Is the cross-price elasticity of demand for GoodNotes and Apple Pencil (with respect to Notability) positive or negative? Explain.
  - c. (12%) After Notability switches to annual subscription, what happens to the markets of GoodNotes and Apple Pencils? Draw supply and demand diagrams to illustrate the change in equilibrium prices and quantities.

**Part D (30%): Excerpts from "COVID-19 pandemic in Taiwan - After first case reported" (Wikipedia)<sup>6</sup>**

...On 24 January, the Taiwanese government announced a temporary ban on the export of face masks for one month to secure a supply of masks for its own citizens. The ban was extended twice; on 13 February until the end of April, and on 13 April until the end of June. On 6 February, the government instituted a mask rationing system, requiring citizens to present their National Health Insurance card...(omitted)...In early February 2020, Taiwan's "Central Epidemic Command Center" requested the mobilization of the Taiwanese Armed Forces in both containing the spread of the virus and in building up defenses against it. Soldiers were dispatched to the factory floors of major mask manufacturers to

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<sup>5</sup> By Umar Shakir, the Verge: <https://www.theverge.com/2021/11/3/22761662/notability-notes-ginger-labs-subscription-rollback-apology>

<sup>6</sup> Wikipedia entry: [https://en.wikipedia.org/wiki/COVID-19\\_pandemic\\_in\\_Taiwan#After\\_first\\_case\\_reported](https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Taiwan#After_first_case_reported)

help staff the 62 additional mask production lines that were being set up at the time. In early March, Taiwan's average production of surgical face masks reached 9.2 million per day. By the end of March, the daily production of surgical face masks reached 13 million.

**Excerpts of “Face mask price drops as gov’t weighs in, factories return to work” (China Post, 2020/1/31)<sup>7</sup>**

The flat price for face masks will be lower to NT\$6 (US\$0.2) per piece starting Feb. 1, authorities announced on Thursday. The price will be reduced by NT\$2 per piece from the current NT\$8 after discussions with manufacturers and retailers, the Ministry of Economic Affairs (MOEA) said in a statement released on Thursday. The original price was set by the epidemic response command center during the Chinese New Year holiday as an emergency measure to take control over the face mask business in light of the novel coronavirus outbreak. Thursday’s announcement came after growing concern that NT\$8 per piece is far too expensive. Before the outbreak, masks could be purchased at convenient stores at NT\$2 per piece, or NT\$40 per box of 10 pieces. The ministry said in Thursday’s statement that the reason behind the original price during the holidays was the cost for logistics and manufacturing was higher then. Now that the country has returned to normal workdays, the cost went back to normal, hence the price drop. “Once market supply and demand are restored to normal in the future, the price will again be determined by the market mechanism,” the statement added.

Earlier this week, the epidemic response command center announced that the government will release four million face masks from local manufacturers every day to ensure that the general public has access to protective gear amid the novel pneumonia outbreak. Two out of the four million will be appropriated to convenience stores, where the general public can purchase up to three masks per transaction. The remaining will be sent to hospitals, medical institutions, and professional medical supply stores near hospitals, Health and Welfare Minister Chen Shih-chung said on Thursday. The policy is set to remain in place until Feb. 15, according to Chen. The epidemic command center advised the public to call 1950 if they see any irregularities in masks’ price.

**Answer the following questions:**

1. (8%) Draw a supply and demand diagram to analyze Taiwan’s market for facial mask. How did the outbreak of COVID-19 in January 2020 affect equilibrium price and quantity, as well as the amount of imports or exports?
2. The government imposed a price ceiling of NT\$8 per mask during the Chinese New Year holiday.
  - a. (8%) Draw a supply and demand diagram of Taiwan’s mask market to analyze the effect of this policy on equilibrium price, and quantity supplied and quantity demanded.
  - b. (3%) Was there a shortage or surplus? If yes, how did the Taiwanese society resolve it?
3. The government later ramped up the supply of masks, so people can easily buy masks in most local pharmacies.
  - a. (8%) Draw a supply and demand diagram to analyze the effect of production boost on equilibrium price and quantity, as well as the amount of imports or exports.
  - b. (3%) Is the price ceiling still binding or not? Explain.

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<sup>7</sup> By Mimi Hsin Hsuan Sun: <https://chinapost.nownews.com/20200131-944889>