Principles of Microeconomics – Final Exam [2021/1/15]

Note: You have 180 minutes (9:10am-12:10pm) to earn 100 points. Allocate your time wisely.

Part A (23%): Excerpts of "National health insurance premium rate raised to 5.17%" (2020/12/31)[1]

Taipei, Dec. 31 (CNA) Taiwan's national health insurance premium rate will be increased from the current level of 4.69 percent to 5.17 percent from Jan. 1, 2021, Minister of Health and Welfare Chen Shih-chung (陳時中) announced Thursday. The adjustment is necessary to make up the losses incurred by the National Health Insurance Program, which is expected to be in deficit by NT$77.1 billion (US$2.7 billion) and see its reserve fund exhausted by the end of next year, Chen said. The rate is to be increased to 5.17 percent, the same level as in 2013, as part of government efforts to offset the impact of the COVID-19 pandemic, which has had severe economic costs over the past year, he added…(omitted)… On average, employees will see their national health insurance premium increase by NT$63 per month, with 70 percent having to pay an increase of less than NT$70 per month, he said. In response to the policy change, National Association of Small and Medium Enterprises chairman Li Yu-chia (李育家), complained that the entire sector will see its operating costs rise by over NT$50 billion annually. It will take a toll on Taiwan's small businesses, as they have not yet recovered from the fallout from the COVID-19 pandemic, he said…(omitted)

Assume the firm is a price-taker in both the labor market and the output market. First consider the labor market and answer the following question:

1. (4%) How does the national health insurance premium rate hike affect the amount received by the workers? What about the amount paid by the employers? Would the two parties share the rate hike burden exactly according to the contribution ratio of 30% and 60% set by the National Health Insurance Administration?[2] Why or why not?
2. (4%) How would equilibrium wage and equilibrium employment change with this rate hike? Draw a supply and demand diagram of the labor market to illustrate.
3. (2%) What is the welfare effect of this rate hike? Does the deadweight loss (if any) increase? Explain.

Now consider the output market and answer the following question:

4. (5%) How would this rate hike affect the cost of production? How would a profit-maximizing firm adjust its price and quantity for its output? Draw a supply and demand diagram of the output market to illustrate.
5. (6%) How is the worker's value of marginal product affected by this shift in the output market? How would that affect labor demand? Draw a supply and demand diagram of the labor market to illustrate the change in equilibrium wages and employment.
6. (2%) Explain why your answer to Question 5 should or should not be consistent with your answer of Question 2.

Part B (19%): Excerpts from "The Pandemic Is a Prisoner's Dilemma Game" (2020/12/20)[3]

…The pandemic presents an everyday complexity of such choices. Imagine, Dr. Bauch said, if everyone followed public health recommendations: They wore masks, socially distanced, washed their hands, followed stay-at-home orders. "In that case there is a significantly reduced risk of infection," he said…(omitted)... Dr. Bauch did pioneering work combining game theory and epidemiological modeling, with colleagues including

[1] By Flor Wang and Chang Ming-hsuan, CNA: https://focustaiwan.tw/society/202012310023
[2] Taiwan NHI: https://www.nhi.gov.tw/English/Content_List.aspx?n=B9C9C690524F2543&topn=46FA76EB55BC2CB8
[3] Siobhan Roberts, New York Times: https://www.nytimes.com/2020/12/20/health/virus-vaccine-game-theory.html

Alison Galvani, an epidemiologist and the director of the Yale Center for Infectious Disease Modeling and Analysis. "Vaccination decisions based purely on self-interest can lead to vaccination coverage that is lower than what is optimal for society overall," Dr. Galvani said in an email.

The self-interest strategy maximizing individual payoff is called the Nash equilibrium. Dr. Galvani's later research included psychological data and demonstrated that vaccination decisions can be influenced by altruism, thereby boosting uptake beyond the Nash equilibrium and serving the common good.

Answer the following questions:

1. (2%) Suppose there exists two groups of people. If a group follows the regulation, each group will receive 15 units of happiness. If both groups follow the regulation, each will receive 30 units of happiness. However, following the regulation will cause inconvenience, so the group which follows the regulation will lose 20 units of happiness. Sketch the game matrix of this Prisoners' Dilemma.
2. (3%) Is there any dominant strategy in this situation? What is the Nash equilibrium of the game?
3. (2%) Suppose another way to counter the virus is to be vaccinated. Would the result be the same as that of Question 2? Why or why not?
4. (2%) Suppose the whole society has agreed to be vaccinated and wear masks. Would people have the incentives to renegade from the agreement? Why or why not?
5. (4%) Now assume players are altruistic and receive as payoff the sum of both player's happiness. Draw the new game matrix. Is there any dominant strategy? What is the Nash equilibrium of this game?
6. (4%) What if only one player is altruistic and receive as payoff the sum of both player's happiness. Draw a third game matrix. Is there any dominant strategy? What is the Nash equilibrium of this third game?
7. (2%) Which game better describes the case of Taiwan? Explain.

Part C (31%): Excerpts of "Giga-Sweatshop Meets Corporate Overlords: An Exclusive Look Into How Tesla China Runs its Shanghai Gigafactory 3" (2020/9/16)[4]

…On July 13, 2018, Tesla signed an agreement with the Shanghai Municipal Government to build its first factory in China. Then in just six months, the factory broke ground. A year later, the first batch of Model 3 was delivered. By October, the Chinese-made Model 3s are already shipping to Asia and Europe. There's no better example of "China speed" than the existence of the Gigafactory 3. White shuttle busses filled with Tesla workers are also commonly seen around the factory. 2020 saw Tesla's stock price rose six-fold. In the third quarter, the production of Tesla EVs reached 145,000 units, a 51% year-over-year up. It is, however, these workers, who are barely distinguishable with their reflective suits and safety hats, that contributed the most to Tesla's record-breaking performance throughout 2020, as output at Tesla factories located in both US and Europe continue to suffer from the extended COVID-19 pandemic.

Tesla's utilization of China Speed brought its market cap to around $610 billion, stunning Wall Street analysts and Silicon Valley peers, making the company being seen as a beam of hope that is going to ultimately change the world. However, the behind-the-scene stories inside the non-stop Shanghai Gigafactory have been much darker than the seemingly bright, miraculous outside, PingWest has found.

"Tesla is doing whatever it can to hit the production goal, including lowering its quality standards," several current and former Tesla China employees told PingWest. An employee of the warehouse and logistics department said that there have been numerous cases where defective parts miraculously disappeared…(omitted)…One source told PingWest in at least one instance defective parts have been loaded

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[4] 陳柯芯(Originally appeared on 品玩 Chinese ed.; content modified for clarity): https://en.pingwest.com/a/8154

onto production vehicles. The existence of these parts in Tesla's supply chain may also have been the result of speed pressure. "We simply can't make enough parts that meet quality standard. It's stressful," said a representative of a Tesla supplier who wishes not to be named, "the solution has been straightforward: just take the defective parts, and send them to Tesla."

…(omitted)…At least in China, these quality defect and safety issues have not been much of a concern for Tesla, which is all-in on production capacity,…(omitted)…"Tesla's production volume is insanely high," said many Tesla China employees and automotive insiders who spoke to PingWest. The barely 1-year-old Gigafactory 3 produced 22,900 electric vehicles in October this year, crossing the 20,000 monthly production volume milestone that took Beijing Benz Automotive (Mercedes-Benz' Beijing J.V.) 10 years. It would also take the 2 strongest domestic E.V. competitors the entire year to match that number.

However, PingWest has found that the insanely high production volume has not been the direct result of the technological advancement that Tesla is known for, but rather the same old high-intensity manual labor that still plagues many industries inside China. Such high-intensity production soon wore out the vision that many workers in Tesla's Shanghai factory once had towards their jobs and the company. Simultaneously, the rapidly shrinking benefits and increasingly harsh working conditions eventually made many had enough. The ever-increasing capacity targets have allowed many factory operations to break, or even abandon entirely in some cases, their original rules and standards…(omitted)…Many current and former employees point their fingers toward Tom Zhu (Zhu Xiaotong), Tesla's Global Vice President and President for Greater China…

Answer the following questions:

1. (2%) Is Tesla Model 3 a homogeneous or heterogeneous product? Which market structure best describes the market for Tesla Model 3? Perfect competition, monopoly, monopolistic competition or oligopoly?
2. (2%) How would a profit-maximizing firm in this market determine quantity and price? Explain.
3. (2%) Would the firm be making profit in the long run? Why or why not?
4. (3%) It seems that Tesla's China Gigafactory has a race to the bottom in terms of quality as it ramps up quantity. What is the asymmetric information problem of the China market for Tesla Model 3 that is causing this race? Does this resemble the "market for lemons" in the used car market? Why or why not?
5. (3%) Assume the race to the bottom of quality is wide spread throughout the industry, so all electrical vehicles (EV) sold in China are now homogeneous products. Which market structure best describes the EV market? Perfect competition, monopoly, monopolistic competition or oligopoly? Does your answer depend on the number of firms producing EV in China? Why or why not?
6. (2%) How would a profit-maximizing firm in this market determine quantity and price? Explain.
7. (2%) Would the firm be making profit in the long run? Why or why not?
8. (3%) Given Tesla is now producing much more Model 3 than before, how likely did its average cost change? Is this possible under constant return to scale, economies of scale, or diseconomies of scale? Explain.
9. (4%) Consider a competitor of Tesla which also produces EV. As Tesla increases production and lowers its price of Model 3, when would this competitor decide to shut down? When would it decide to exit? Do you think Tesla has these competitor reactions in mind when it increased production? Explain.
10. (2%) What is the production process called if there are economies of scale throughout the range of output, 1 (one buyer gets a Model 3) to 1300,000,000 (each person in China gets a Model 3)? Which market structure best describes this case? Perfect competition, monopoly, monopolistic competition or oligopoly?
11. (2%) How would a profit-maximizing firm in this market determine quantity and price? Explain.
12. (2%) Would the firm be making profit in the long run? Why or why not?
13. (2%) Why do you think Tom Zhu decided to solely focus on ramping up production in China? Explain.

Part D (27%): More Excerpts of "Giga-Sweatshop Meets Corporate Overlords…" (2020/9/16)

(continued)…Back in July this year, local e-commerce giant Pinduoduo and second-hand car sales platform YiAutos had a sales event giving people as much as 40,000 RMB in discount to get a Tesla Model 3. While shutting down some buyers' access to delivery, Tesla China, as well as Zhu and Tao posted on social media accounts that this sales event has not been sanctioned by the company and is therefore illegal. Employees told PingWest that Zhu personally asked all pedders to repost their messages and "defend Tesla's direct sale model." But sources close to YiAutos told PingWest that long before the company launched the event with Pinduoduo, there were already discounted Model 3 orders being processed which Tesla China never intervened. These people said that this time Pinduoduo's massive popularity turned the event into trending news, and only after that Tesla China executives were forced to openly disclaim…

Consider the retail market of Tesla Model 3 in China with only two main players, Pinduoduo and YiAutos:

1. (2%) Suppose each firm has two strategies, hold a sales event to give people discounts or not, resulting in four possible strategy profiles, (sale, sale), (sale, not), (not, sale), and (not, not), in which the first is Pinduoduo's strategy and the second is YiAutos'. How would payoffs of (sale, sale) be ranked compared to that of (not, not), so Tesla China would rule the sales event (of both firms) illegal? Explain.
2. (2%) How would YiAutos' payoff of (not, sale) be ranked compared to its payoff of (not, not), so that it would secretly have "discounted Model 3 orders being processed"? Explain.
3. (2%) How would Pinduoduo's payoff of (not, sale) be ranked compared to its payoff of (sale, sale), so that it would want to organize the sales event with YiAutos? Explain.
4. (4%) Draw the game matrix of this game, assuming the two firms are somewhat symmetric. Does Pinduoduo have a dominant strategy? What about YiAutos?
5. (3%) What is the Nash equilibrium of this game? Does the equilibrium outcome match what is described in the article? Explain.

(continued)…YiAuto did not comment on the supply origin of their discounted Model 3 orders, while on the other hand, PingWest has found out that even after the Pinduoduo incident, Tesla China's store sales personnel in Shanghai are still selling Model 3s at discounted prices through private channels that directly contradict the company's sacred direct sales model. In numerous WeChat group chats seen by PingWest, local sales personnel are promoting heavily discounted like-new Model 3s that they said are either sold but unsuccessfully delivered or company vehicles…(omitted)

Now consider smaller players in the retail market of Tesla Model 3 in China, such as local sales personnel:

6. (1%) Are the sales personnel selling homogeneous or heterogeneous products?
7. (3%) Suppose each salesperson can choose to offer secret discounts or not, and their goal is to maximize their own profit. Would the final outcome be good for the sales personnel as a whole? Would it be good for the society? Explain.
8. (3%) What would the price be in this market? Which market structure best describes this retail market outcome? Perfect competition, monopoly, monopolistic competition or oligopoly? (Hint: If you cannot find a perfect fit, choose the closest market structure and explain why you think it is closest.)
9. (3%) According to the textbook, how would profit-maximizing sales personnel in this market determine quantity and price? Compare your answer here with your answers to the previous question.
10. (2%) Would the sales personnel be making profit in the long run? Why or why not?
11. (2%) Does moving from two main players to many small players make a difference? Explain.