

Principles of Economics I: Microeconomics – Final [2018/1/5]

Note: You have 170 minutes (10:20am-1:10pm), and there are 100 + bonus 10 points; allocate your time wisely.

Part A (32%): Excerpts of “Free rides boost Kaohsiung MRT traffic by 10 percent” (Taipei Times, 12/2/2017)¹

The number of passengers who took the Kaohsiung Mass Rapid Transit (MRT) during morning peak hours rose more than 10 percent yesterday, the first day the city provided free public transport in an effort to combat air pollution, data released by Kaohsiung Rapid Transit Corp showed. The data showed that the number of passengers taking the Kaohsiung Metro from 6:30am to 8:30am totaled 26,970 — up 3,072 or about 13 percent from the same period on Friday last week.

The free public transportation program was announced by Kaohsiung Mayor Chen Chu (陳菊) three days ago following a deterioration in air pollution in the largest city in southern Taiwan. Under the free public transport program, holders of electronic cards, including the iPass, can also take city buses, highway buses and light rail trains free of charge from 6:30am to 8:30am and from 4:30pm to 6:30pm during weekdays... (omitted)...The program, initiated by Kaohsiung’s Environmental Protection Bureau (EPB) at a time of worsening air pollution in central and southern Taiwan, will run until Feb. 28...(omitted)

1. (7%) What is the number of passengers taking the Kaohsiung MRT from 6:30am to 8:30am on Friday the week before rides were free? Use the midpoint method to calculate the percentage change in quantity demanded for Kaohsiung MRT. Is it “about 13 percent”? Why or why not?
2. (4%) Use the midpoint method to calculate the percentage change in price due to this new policy. Do you need to know what the original price to make such calculations? Why or why not?
3. (3%) What is the price elasticity for Kaohsiung MRT? Is the demand elastic or inelastic?

Excerpts from “高捷冬季免費傳捷報！今尖峰運量增 21%、比首日加倍” (自由時報 2017-12-04)²

〔記者王榮祥／高雄報導〕今天是高雄市大眾運輸冬季免費措施上路後的第一個星期一，高雄捷運尖峰時段運量共 6 萬 9559 人次，比上個星期一增加 1 萬 2109 人次，成長 21.1%；上週五免費首日尖峰增長幅度為 11.4%，今天成長幅度比免費首日幾乎多出一倍。... (omitted)

4. (7%) What is the number of passengers taking the Kaohsiung MRT during rush hours on Monday the week before rides were free? Use the midpoint method to calculate the percentage change in quantity demanded and the price elasticity for Kaohsiung MRT. Is the demand elastic or inelastic?
5. (2%) The news articles deem this policy as a success. Do you agree or disagree? Explain.
6. (4%) How would this policy affect the marginal product of labor for delivery workers based in Kaohsiung? How would this affect their wages? Explain. Would your answer change if this were implemented in the long run instead of the short run? Why or why not?
7. (3%) On Dec. 27, 2017, Taiwan News reported that “Children between 6 and 12 who reside in New Taipei City will be eligible for 50% discounts on the MRT and buses starting early in 2018.”³ What do you expect would happen after New Taipei children receive 50% discounts on MRT fares? Explain.
8. (2%) Why are metropolitan mayors coming up with these policies? (Hint: What is coming up this year?)

Part B (24 + bonus 5%): Excerpts from “無人店 vs. 科技店 超商雙雄對決” by 李至和 (經濟日報 2017/12/10)⁴

2018 年超商業重頭戲就是 7-ELEVEN 與全家便利商店將推出科技概念店，7-ELEVEN 將領先國內零售/開出首家無人商店，全家計畫推出新型態科技概念店，兩強戰場從商品銷售延伸到科技應用，互別苗頭意味濃厚。

統一企業集團董事長羅智先在今年集團耶誕點燈「愛·Sharing」活動上語出驚人表示，「明年 7-ELEVEN 將會開無人商店，比預期速度還快」，此話一出，震動國內零售業，連羅智先幕僚群都沒做好準備，老闆會將這個秘密武器說出來。全家董事長葉榮廷早在今年中旬就拋出將開科技概念店的策略，目前進度稍稍落後，將推遲至明年上半年才能亮相。葉榮廷說，適合的店不好找，至少需 60 坪以上店面，相關細節內部也還在調整中，明年一定會推出。

據了解，兩大超商在新型態科技店中，會廣泛應用如人臉辨識或刷掌紋來辨識消費者身分，因此店內必然會有許多攝影相關設備；結帳可使用行動支付工具，或在商品上應用 RFID 標籤，買完東西即可自動付款、結帳；廣泛利用 AI 人工智慧技術，收集消費者購買行為大數據，並針對不同消費者發送個別促銷訊息，也可能在科技店中展現。... (omitted)...

如同羅智先說「未來想要增加門市人力，從現實考量是相當困難的」；葉榮廷也表示，科技概念店不是沒有員工，但在人力上可以精省，這也是對應趨勢提前做的準備。葉榮廷說，現在超商員工要做的事情很多，有些事情其實可以應用科技取代，如貨架上的商品管理、庫存報廢等相關整理工作現在都已有相關技術可應用，結帳若以支付工具取代現金，可有效縮短結帳時間。

無論是無人商店還是科技概念店，為提高科技含金量，必須使用許多傳統超商沒有應用的設備，單店投資金額估計超過千萬元，相較一般超商單店投資至少高出一、二倍以上，因此初期僅會以小規模、甚至只有一家為測試，要全面規模化成普遍現象，可能還有十年長路要走。

1. (1%) Family Mart and 7-11 are two largest convenient store chains in the market. First assume Family Mart is a perfect substitute of 7-11. Which market structure best describes this market?
2. (3%) Consider a game played between 7-11 and Family Mart near National Daiwan University. Suppose total revenue of convenient stores is about 100 million per year. If they both don't open high-tech stores by the end of 2018, revenue is split equally. If only one opens, that chain earns 70 million (while the other earns 30 million). If both opens, revenue is split equally. Opening a high-tech store by the end of 2018 costs 10 million. Draw the payoff matrix of the game assuming there is no other operation cost.
3. (4%) What is the dominant strategy of this game (if there is one)? What is the Nash equilibrium?
4. (3%) According to the news article, 7-11 and Family Mart initially planned to open high-tech stores by the end of 2018, but now have another option, namely "speed up and open the high-tech store by June." Suppose speeding up and opening by June costs 15 million, and if one opens earlier (by June), but the other opens late (by the end of 2018), the earlier one earns 65 million (while the other earns 35 million). Draw the new payoff matrix of this modified game.
5. (4%) What is the dominant strategy of this new game (if there is one)? What is the Nash equilibrium?
6. (5%) Now suppose 7-11 and Family Mart are merely partial substitutes of each other. Which market structure best describes this convenience stores market? How would each store chain determine their quantity and price under this market structure? Draw a diagram and explain.
7. (4%) Assume there is little barrier of entry. Draw a graph and illustrate the long run equilibrium of this market. What is the long-run economic profit for 7-11 and Family Mart? Explain.
8. (bonus 5%) Suppose each AI server costs NT\$500k and maintenance costs NT\$10k per month, but one AI server can do twice the work of a human staff, whose salary is NT\$25k a month. Would you replace the human workers with AI servers? How does your decision depend on timing (short run vs. long run) or economies of scale? Can you use this to explain why only 7-11 and Family Mart want to introduce unmanned stores, but not the other convenient store chains in Taiwan?

Part C (22% + bonus 5%): Student Collusion in Professor J's Exam Question Contests

Professor J decided to host an exam question contest, asking students to form groups to propose questions for the final exam. The group which proposed the best question will be rewarded with having their question appear in the exam. This gives the winning group an advantage to boost their grades, while other groups struggle to answer the tough question proposed. Before the contest, students call for a meeting to discuss the possibility of all submitting simple questions so everybody gets good grades easily.

1. (3%) Consider this game where each group has two strategies: Submit an easy (but crappy) question vs. Submit a brilliant (but tough) question. Is there a dominant strategy for each group? Explain.
2. (5%) Suppose all groups agree to submit easy questions. Would each group renege from the agreement if they wanted to maximize their grades? Why or why not? What is the Nash equilibrium of the game?
3. (3%) Suppose one group decides to submit their question first and announces that it was a simple question. Assuming the announcement is non-verifiable, would other groups follow suit if they wanted to maximize their grades? Why or why not?
4. (5%) Now assume the TA receives the first question and confirms that an easy question was just submitted. Would other groups follow suit if they wanted to maximize their grades? Why or why not? What if the TA would confirm whether each question submitted sequentially was also an easy question?
5. (3%) Suppose Professor J decides to host two contests, one for the midterm and another for the final exam. Would this increase the possibility of student collusion? Why or why not? (Hint: Would the outcome differ in the final exam contest? Anticipating that outcome, what is the outcome of the midterm exam contest?)
6. (3%) How would your answers to the above questions change if some students care not only about maximizing their own grades? Explain.
7. (bonus 5%) How can your answer to the above questions apply to the following article? Explain.

Excerpts from "Chunghwa keeps low-cost 4G plan in blow to peers," by Lisa Wang (Taipei Times, 2017/3/2)⁵

Chunghwa Telecom Co (中華電信), the nation's largest telecom, for the second time extended its lowest flat-rate subscription plan for 4G services, dashing its peers' hopes of an end to a price war. The telecom yesterday said that its NT\$699 plan for unlimited 4G data usage would still be available until March 15. The plan was originally set to expire on Tuesday... (omitted) ...

The company's moves came amid persistent calls from local peers to cancel the cut-rate tariffs, with the firms saying that flat rates are cramping profits and the price war has become irrational. The nation's top three telecoms launched low-price subscription plans about three years ago in a bid to stimulate the adoption of 4G, but they have struggled to phase them out due to stiff market competition.

To counter pricing competition from Chunghwa Telecom, Far EasTone Telecommunications Co (遠傳電信), the nation's No. 3 telecom, yesterday said it would resume its cheapest flat rate plan for unlimited 4G data usage today. Far EasTone charges subscribers NT\$698 per month for unlimited 4G Internet access. Far EasTone scrapped the rate as planned on Feb. 22, and unveiled a substitute plan... (omitted) "In response to market conditions and to cater to consumers' needs, Far EasTone is to relaunch the NT\$698 rate plan," Far EasTone said in a statement yesterday. Taiwan Mobile Co (台灣大哥大), the nation's No. 2 telecom, said early last month that it was looking at scrapping its lowest NT\$700 per month 4G subscription plan last month, but it has yet to announce its cancelation.

Part D (22%): Excerpts from “Your Uber Car Creates Congestion. Should You Pay a Fee to Ride?” By Winnie Hu (New York Times, 2017/12/26)⁶

An explosion of ride-hailing app services has transformed the way that people get around the city and is choking the streets. Midtown traffic crawls at an average of 4.7 miles per hour from 6.5 miles per hour five years ago... (omitted) ...About 103,000 for-hire vehicles operate in the city, more than double the roughly 47,000 in 2013, according to the Taxi and Limousine Commission. Of those, 68,000 are affiliated with ride-hailing app companies, including 65,000 with Uber alone, though they may also provide rides for others. In contrast, yellow taxis are capped by city law at just under 13,600.

Now a new report finds that ride-hailing cars are often driving on the city’s busiest streets with no passengers—in effect, creating congestion without any benefits. The report by Bruce Schaller, a former city transportation official, found that more than a third of ride-hailing cars and yellow taxis are empty at any given time during weekdays in Manhattan’s main business district. The ride-hailing cars average 11 minutes of unoccupied time—compared with eight minutes for yellow taxis—in between dropping off one passenger and picking up another, according to the report... (omitted)

New York City is considering a new fee on for-hire vehicles at a time when the state-controlled Metropolitan Transportation Authority is in dire need of money to overhaul the city’s decrepit subway system. Advocates say it would be easier to push through the State Legislature than tolls on the East River bridges and already has a precedent: a 50-cent surcharge on cab rides that goes to the transportation authority. The ride-hailing services are not subject to that surcharge, but collect state and local sales taxes on each ride... (omitted)

Alix Anfang, an Uber spokeswoman, said simply adding a fee would not address an already unfair fee system in which Uber riders pay more in sales tax than taxi riders pay with the 50-cent M.T.A. fee. The minimum fare for an individual Uber ride in New York City is \$8, which amounts to a sales tax of 71 cents...(omitted)... “The existing ride-hailing tax unfairly burdens outer borough New Yorkers who pay far more in taxes per trip than Manhattan taxi riders,” Ms. Anfang said, “which is why Uber believes a new transit tax system should fully fund mass transit by setting fees based on how crowded the roads are, not the type of vehicle people are traveling in.” (omitted)...

1. (4%) Assume riders care only about getting to their destination quickly, but the number of yellow taxis are limited by law. Which market structure best describes this market before there were ride-hailing apps? Draw a diagram to discuss the effect for such governmental regulation on the taxi market.
2. (5%) Now NYC has plenty of drivers who would respond to each ride-hailing app. Which market structure best describes this for-hire vehicle market? How would drivers behave in this market? (Hint: What happens if they refuse to accept the price shown on the app?) What is the individual supply curve for each driver?
3. (3%) Assume there is little barrier of driver entry. Is the long-run (market) supply curve flat? Why or why not? (Hint: Do firms have identical costs? Do the costs change as other firms enter or exit the market?)
4. (2%) Suppose all uber drivers agree to stay off the road for 5 minutes when unoccupied. Would the drivers renege from this agreement? Why or why not?
5. (4%) Are ride-hailing services currently paying the 50-cent M.T.A. fee? What is the percentage of sales tax they are paying? Explain why they think the current fee system is unfair.
6. (4%) What is the effect of imposing a universal surcharge on all rides? Draw a graph and explain.

Appendix for Part A: Translation of “高捷冬季免費傳捷報！今尖峰運量增 21%、比首日加倍” (自由時報 2017-12-04)

This is the first Monday after the Kaohsiung free public transportation program. The number of passengers during peak hours totaled 6,9559, up by 1,2109 from the previous Monday, a 21.1% rise. The first day of the free program last Friday saw an increase of 11.4% during peak hours, and today's growth is nearly twice as much that of last Friday. ...(omitted)

Appendix for Part B: Translation of “無人店 vs.科技店 超商雙雄對決” by 李至和 (經濟日報 2017/12/10)

A major event of 2018 is the competition between the biggest convenience store chains 7-11 and Family Mart. 7-11 will be opening the first unmanned retail store in Taiwan, while Family Mart is also planning to launch its new tech-stores.

Uni-President, the conglomerate that owns 7-11, chairman Alex Lo (羅智先) said that the process of opening the new unmanned stores in 2018 is "faster than expected", stunning the Taiwanese retail industry as well as his team, surprised to find that their boss is revealing this secret weapon.

Taiwan FamilyMart Co. chairman Yeh Jung-ting (葉榮廷) has announced the idea of new tech-stores earlier in 2017, but the process is now slightly behind, postponing the opening to the upper half of 2018. Suitable locations for the tech-stores are not easy to find, requiring a size of at least 60 pings (3.306m²), and the related details are still being worked on, said Yeh.

The two chains will be utilizing facial recognition or hand-print scanning technology to identify customers, requiring heavy uses of camera equipment; Radio Frequency Identification (RFID) labels will be applied on products so that automatic payment can be made with smartphones; artificial intelligence technologies will be used to collect massive information generated from consumers' purchasing decisions, and to offer personalized promotions to customers ... (omitted).

According to Alex Lo, "from realistic considerations, in the future it will be difficult to add store staff members", and Yeh Jung-ting has also expressed that though human staffs will still be needed, labor demand can be very much reduced, and Family Mart is getting prepared for the trend.

Convenience store workers currently have to handle a lot of tasks, but these can actually be done using technologies, said Yeh, for example, there now exist applicable technologies for shelf management and inventory disposal, and time can be saved using payment technologies instead of cash.

It is estimated that the unmanned stores or the high-tech stores require more than 10 million NT\$ investment for one single store, an amount that can be twice the investment needed for traditional stores. The new stores will be experimental and the scope will be limited to only a few, or even one, in initial stages. It might take another ten years before they become widely adopted.

See also (For Question 7): Excerpts from “電信低價吃到飽打死不退 NCC：要勇敢” (中央社 2017/12/28)⁷

(中央社記者江明晏台北 28 日電) 台灣電信產業今年低價吃到飽持續，5 大電信「敵不退、我不退」，NCC 今天喊話「要勇敢」；但業者坦言，明年別說吃到飽退場，就連要提高吃到飽門檻都很難。...

(omitted)...電信業今年 4G 低價吃到飽趨勢持續，儘管今年 2 月底有相繼退場的契機出現，最終仍是曇花一現，在競爭壓力驅使下，5 大電信呈現「敵不退、我不退」的僵局，導致數據量雖然不斷飆升，電信行動營收卻不增反減，恐造成電信業在建設網路與投資 5G 時縮手。對此，NCC 發言人翁柏宗今天在會中鼓勵業者「要勇敢」，意即希望業者勇敢跨出第一步，不管是誰率先鳴槍，盼能打破目前僵局，挽救惡性循環的局面。

明年吃到飽能否退場？中華電信總經理謝繼茂今天表示，「去年就有勇敢(退場)過，但大家都不跟我們，結果就很慘」，他說，「大家都說我們是龍頭，要率先開槍，但被咬過後，往後要考慮退場或拉高門檻都會很謹慎。」至於明年吃到飽是否有退場可能性？謝繼茂坦言不可能，就連將吃到飽拉高門檻的機會也沒有，市場連 188 終身吃到飽都出來了，但門檻要再往下也很難。

台灣市場小卻有 5 家電信業者，遠傳電信總經理李彬表示，任何市場有超過胃納量的競爭者，就會有市值往下掉的狀況，主管機關要業者勇敢，但當業者開始勇敢，只能試一下水溫，2 個禮拜就只能被迫縮回來，主管機關「講勇敢」也只是空話。明年吃到飽能否退場或是提高門檻？她認為，只要台灣有 5 家電信業者，加上明年 3G 到期，用戶要加速升級到 4G，目前競爭態勢，不會太可能發生。...

¹ <http://www.taipeitimes.com/News/taiwan/archives/2017/12/02/2003683302>

² <http://news.ltn.com.tw/news/life/breakingnews/2273301>

³ Keoni Everington (2017), Taiwan News, 2017/12/27: <https://www.taiwannews.com.tw/en/news/3328879>

⁴ <https://money.udn.com/money/story/5612/2866332>

⁵ <http://www.taipeitimes.com/News/biz/archives/2017/03/02/2003665944>

⁶ <https://www.nytimes.com/2017/12/26/nyregion/uber-car-congestion-pricing-nyc.html>

⁷ <http://www.cna.com.tw/news/afe/201712280120-1.aspx>