

## Principles of Economics I: Microeconomics – Final [2017/1/13]

Note: You have 3 hours (9:10am-12:10pm), and there are 100 (+ 10 bonus) points. Allocate your time wisely.

### Part A (30%): The Independence Game

**Excerpts from “The Taiwanese see themselves as Taiwanese, not as Chinese” (Washington Post, 1/2/2017)  
By Fang-Yu Chen, Wei-ting Yen, Austin Horng-en Wang and Brian Hioe**

...For the past decades, Emerson Niou, a political scientist at Duke University, has administered a series of questionnaires to Taiwanese citizens by randomized telephone interview (conducted by the Election Study Center of the National Chengchi University). These surveys revealed that about three-quarters of the respondents would support Taiwanese independence if it would not cause the PRC to attack Taiwan. Put differently, survey evidence shows that most Taiwanese may see formal independence as their ultimate goal, not simply the ability to “function with some degree of autonomy,” as Obama stated.

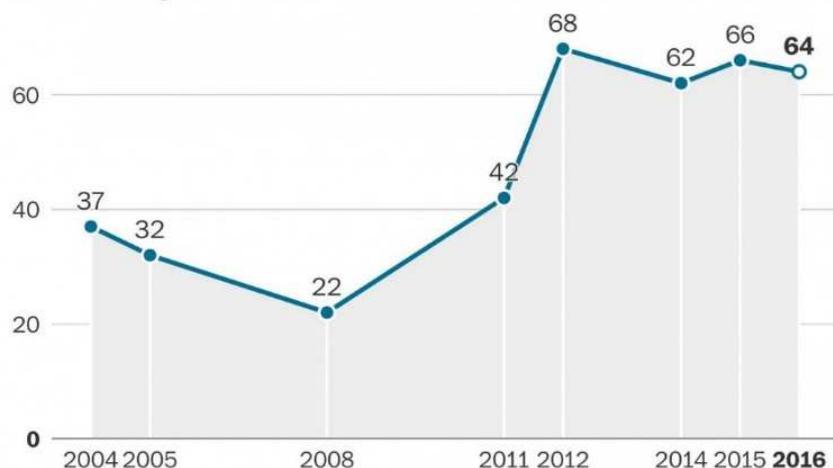
For Taiwanese younger than 40, pro-independence support reaches 84 percent. Perhaps most startling, 43 percent of the under-40 generation would support independence even if it meant China would attack Taiwan under the risk of war...

1. (4%) Consider the sequential game played between the Taiwanese people and Beijing. Taiwanese people can choose to seek de jure independence or maintain the status quo. Status quo yields a payoff of zero for both parties. If the Taiwanese people choose to seek de jure independence, Beijing can decide whether to invade or concede. Let the monetary payoff for Taiwanese people if they choose to seek de jure independence and Beijing concedes and that if Beijing invades be either +50 or -50. Which is more likely to be +50? Which is more likely to be -50? Explain. Draw the (incomplete) game tree with payoffs for Taiwanese people only.
2. (4%) What would Beijing claim to do to induce Taiwanese people to maintain status quo? Explain. Would the same trick work on the 43% of “under-40 generation that support independence even if China it meant would attack”? Why or why not? (Hint: Do their payoffs differ from other Taiwanese people?)
3. (4%) Now consider the payoff of Beijing. First suppose Beijing can easily take Taiwan by force (so the cost is zero). Let the monetary payoff for Beijing to invade (facing de jure independence) and that for Beijing to concede be either +50 or -50. Which is more likely to be +50? Which is more likely to be -50? Explain. Draw the complete game tree and solve the game using backward induction.
4. (3%) Now consider an additional cost of 100 if Beijing chooses to invade. Draw the new game tree and solve the game using backward induction.

...On the flip side, unification with China has become unpopular. Even under the most favorable scenario — in which there would be little political, economic or social disparities between mainland China and Taiwan — only one-third of Taiwanese citizens say they support unification. That’s a significant drop from the 60 percent who supported unification in 2003.

And yet the Taiwanese are not willing to pursue independence at all costs. Many are concerned with the economy. When asked to choose between formal independence or maintaining economic ties with China, 83 percent chose bread over romance. Moreover, 64 percent worry that China will force Taiwan to accept political concessions via economic connections. That has increased from less than a quarter since the two sides lifted the official trade ban in 2008, as you can see in the figure below...

## Percent of Taiwanese who agree that China will use economic ties to force political concessions



Source: Taiwan National Security Study

THE MONKEY CAGE

[https://img.washingtonpost.com/wp-apps/imrs.php?src=https://img.washingtonpost.com/blogs/monkey-cage/files/2017/01/CHEN-taiwan\\_fig4.jpeg&w=1484](https://img.washingtonpost.com/wp-apps/imrs.php?src=https://img.washingtonpost.com/blogs/monkey-cage/files/2017/01/CHEN-taiwan_fig4.jpeg&w=1484)

- (3%) Now consider a third action of the Taiwanese people—seek unification. According to the above excerpts, is the monetary payoff for Taiwanese people (if they take this third action) more likely to be positive, or negative? Explain. What about the payoff for Beijing? Draw the game tree and explain how adding this action affects (or not affect) your predictions.
- (3%) Suppose Beijing has a third action—cut economic ties if Taiwanese people seek de jure independence. According to the above excerpts, is the monetary payoff for Taiwanese people (if Beijing takes this third action) more likely to be positive, or negative? Explain. What about the payoff for Beijing? Draw the game tree and explain how adding this action affects (or not affect) your predictions.
- (3%) Now consider the case where Beijing is altruistic and has utility equal to the joint monetary payoff of both sides. Draw the new game tree and solve the game using backward induction.
- (3%) What if instead Beijing is spiteful and earns utility equal to the difference between monetary payoffs of both sides. Draw the new game tree and solve the game using backward induction.
- (3%) Which of the above outcomes is closer to match reality? Explain.

### Part B (26%): Shipping Cartels

#### Excerpts from “Shipping Alliances Shore Up Industry, Unsettle Customers” (Wall Street Journal, 1/3/2017)

...Container shipping, which moves 95% of all manufactured goods, is estimated by industry executives to be worth \$1 trillion a year. Traditionally controlled by sovereign-wealth funds and deep-pocketed individuals, it has been a fragmented industry over the past 30 years, with dozens of operators regularly undercutting each other on price...

- (4%) Is the service of container shipping homogeneous or differentiated? Explain. What is the resulting market structure for container shipping? Draw a diagram to explain how a firm determines the quantity to produce and makes pricing decisions.

But overcapacity and sluggish global trade have forced the biggest players to merge or form alliances, allowing them to cut operating costs by hundreds of millions of dollars by sharing ships and port calls. The three major groupings, called 2M, Ocean Alliance and THE Alliance, have cleared most regulatory hurdles over the past two years... (omitted)

According to marine-data providers, the three alliances, which comprise 11 shipping operators, will handle much of the container trade on the Asia-to-Europe and trans-Pacific routes. "The few players left outside will either try to join in, shrink to become regional operators or go belly up," said Lars Jensen, chief executive of Copenhagen-based Sea Intelligence Consulting, adding the world's 20 biggest shipping companies are all expected to post a loss for 2016.

The concentration of power has raised concerns among regulators and cargo owners about price fixing and reduced services, though the Federal Maritime Commission in November said it saw no evidence of price collusion among the alliances... (omitted)

2. (5%) Draw diagrams to illustrate the effect of "sluggish global trade" on the container shipping market, as well as an individual firm's decisions on pricing and amount to produce? What assumptions do you need to reach the conclusion that "shipping companies are all expected to post a loss"? Are they reasonable?
3. (5%) Does container shipping exhibit economies of scale, diseconomies of scale or constant return to scale? Draw diagrams to illustrate the effect of mergers and alliance forming on firm's cost (under the same market structure).
4. (3%) What is the market structure after such consolidation? How would firms behave if they engage in "price collusion"? Explain.

...Nevertheless, the consolidation in the industry is limiting choices for shippers, said Peter Friedmann, executive director of the Agriculture Transportation Coalition, a trade body of 2,500 U.S. agriculture and forest-product exporters...(omitted) ...Cargo owners say they are seeing up to 20% fewer containership sailings across main trade routes and a 10% drop in port calls since the introduction of bigger vessels, known as Triple Es, favored by the alliances. A Triple E, which when turned upright matches the height of the Empire State Building, can move more than 18,000 containers. Its deployment is gradually replacing smaller vessels that because of their size tend to sail more often and serve more ports. Shipping companies say savings resulting from the alliances and bigger ships are passed on to cargo owners. They also say alliances, once in place, will provide more reliable service to cargo owners.

5. (4%) If we consider frequency of sailings, port calls and reliability all as product characteristics, which market structure you learned in class best describes this market? How do shipping companies determine their price and quantity under this market structure? Draw a diagram and explain.
6. (5%) What is the long run profit of shipping firms in this market? What are the assumptions you need to reach this conclusion? Do these assumptions resemble what is now happening in reality? Explain.

**Part C (25%): Lucrative Package as Barrier of Entry to High Tech**  
**Excerpts from "Tech firms shell out to hire and hoard talent" (Economist, 11/5/2016)**

LARGE technology firms used to hold on to their high-flying employees by agreeing not to poach them from each other. "If you hire a single one of these people, that means war," Steve Jobs, Apple's then boss, warned Sergey Brin, a founder of Google, in 2005. That was an illegal arrangement, and in 2015 Apple, Google, Adobe and Intel paid a \$415m settlement to engineers whose pay had been held down as a result...

1. (5%) Consider the game played between Steve and Sergey, assumed to be the only two CEOs of technology companies in Silicon Valley. Both CEOs have to choose whether to hire high-flying employees from the other company. Let the current technology advancement be the outcome if both do not hire from each other, as well as if both do hire. If one of them hires from the other company and the other does not, the company that hires gets an advantage and the other risks going out of business. Draw the payoff matrix of the game (with numbers if you can assume and justify). Is there a dominant strategy for Steve? Is there a dominant strategy for Sergey? Why or why not?
2. (3%) What is the Nash equilibrium of this game? Does the outcome explain what is happening before the arrangement was ruled illegal? Why or why not?
3. (2%) Why do you think the arrangement was considered illegal and tech firms fined for it? Explain.
4. (bonus 3%) Do the assumptions above hold in reality? How would your answers to the above questions change if the assumptions were false?

Today wage suppression in Silicon Valley is even more of a distant memory than dial-up internet and mainframe computers. Last year technology companies in America recorded expenses of more than \$40bn in stock-based compensation. Exact comparisons are difficult, but to put that sum in perspective it is roughly 60% more than the bonus pool paid to the New York employees of Wall Street banks.

The money tech firms throw at employees has ballooned as competition to hire and hang on to top talent in engineering, data science, artificial intelligence and digital marketing has soared. Even entry-level engineers can easily earn \$120,000 a year, more than most people their age can make on Wall Street; mid-career executives with technical expertise who choose to work at large public companies such as Apple, Google and Facebook will pocket several million, including stock grants. The boss of one startup complains that he cannot find a competent chief operating officer who will work for less than \$500,000 a year.

All this is driven by a number of elements. The price of housing plays a part in pushing up salaries. The cost of living in the Bay Area is now 41% higher than the national average and 7% higher than the next most expensive place, New York City, according to Brant Shelor of Mercer, a consultancy. But the biggest spur of change is the enormous appetite for talent. Unlike the best lawyers or doctors, who can see only a limited number of people each day, those with exceptional technical expertise can transform a company because they are capable of creating products that are many times more attractive and thus a lot more lucrative, explains Marco Zappacosta of Thumbtack, a digital marketplace... (omitted)

...Stock-based compensation has its roots in the early days of Silicon Valley, when startups could not afford to pay employees much, if anything, and asked them instead to take a small piece of the company that might rise in value later. What is different today is that many of the Valley's firms are mature with proven track records, so their stock is already valuable and can be used to greater effect. It is being deployed to "strategically hoard" the best talent, says Patrick Moloney of Willis Towers Watson, a consultancy. Once locked in, that talent is then assigned to important projects. This deters people from going to rivals or launching their own startups... (omitted)

...Lacking the same resources, smaller startups blame the giants for distorting the market for high-flyers. "I get the feeling that I can't compete for objectively proven, brilliant talent," says Mike Driscoll, the boss of Metamarkets, an analytics startup. "All I can do is hire diamonds in the rough, who will almost certainly get poached away by larger companies when they start to emerge as very talented." Smaller fry try to find

employees with a different temperament, perhaps those willing to take greater risks or others who find working at a large company dispiriting.

The rising cost of talent has also pushed up the level of funding startups need to raise. The idea that it is cheap to launch a firm is a myth, says Evan Williams, who co-founded Twitter and set up Medium, an online-publishing platform. "It's harder and more expensive than ever to make a startup successful." The more money young companies raise from investors to pay their employees, the harder it is for them to break even or become profitable....

5. (2%) First suppose labor market wages equal to VMPL. Explain why the salary of tech-firm employees could be so high.
6. (4%) What is the price of the final products these tech firms sell? Does that confirm the theory that says  $W=VMPL$ ? Why or why not? What are other reasons the salary of tech-firm employees could be so high?
7. (4%) Explain how such lucrative compensation packages create an entry of barrier for start-ups to enter the market. What kind of market structure you learned in class closest resembles this situation?
8. (2%) What do you think the government can do to promote competition in this market?

#### **Part D (19%): Wage (In-)Equality**

##### **Excerpts from "Ex-Google employee alleges unequal pay" by Jessica Guynn (USA TODAY, 7/21/2015)**

SAN FRANCISCO — Google is taking heat after a former employee alleged a spreadsheet of employee salaries revealed "not great things" about pay equality. The former employee, Erica Baker, said in a series of messages on Twitter that she circulated the spreadsheet to her colleagues while she worked at Google. By the time she left, the spreadsheet contained the salaries of 5% of employees, Baker said. That salary information helped some of her peers negotiate higher salaries, according to Baker. Yet when her colleagues tried to reward her with "peer" bonuses, the bonuses were rejected by her manager, Baker alleged... (omitted)

Baker worked for Google for nine years, according to her LinkedIn profile. She previously wrote a piece on Medium under the name Erica Joy on the challenges she faced as a black woman at Google and in the tech industry, which is under fire for its lack of diversity. Seven out of 10 employees at Google are men. Latinos make up 3% of the work force, African Americans 2%.

Baker, who now works as an engineer at start-up company Slack, made the claims about a Google pay gap in a series of 34 tweets from her @ericajoy account on Friday. Baker says she decided to publicly disclose the situation after people praised Google for honoring civil rights advocate and journalist Ida B. Wells in a doodle on its search page. Baker did not respond to a request for comment. Under California and federal law, employees have the right to share salary information without retaliation. In fact, California is considering a bill that would strengthen the state law.

Pay equity is a hot topic in the industry. Hispanics, Asians and African Americans do not receive equal pay for equal work in the tech industry, USA TODAY reported in October. Hispanics earn \$16,353 a year less on average than their colleagues who are not Hispanic, according to a report from the American Institute for Economic Research. In the same high-skilled positions such as computer programmers and software developers, Asians make \$8,146 less than whites and blacks \$3,656 less than whites, the report found.

Diversity experts have recommended that Silicon Valley offer greater salary transparency to combat pay gaps. "A lot of employees are seeking more transparency in promotions and pay because they suspect there are disparities," said diversity consultant Joelle Emerson, founder and CEO of Paradigm, a strategy firm that consults with technology companies on diversity and inclusion. "Without transparency, it can be impossible to discover if those disparities exist." A growing number of tech start-ups are being more transparent. Social media start-up Buffer, for example, publishes its salary formula on its web site. Yet major tech companies like Google do not make that kind of information available across the organization. "It is important both that companies not have any pay disparities based on factors such as gender and that people perceive their pay to be fair," Emerson said. "Even if Google could show that it did not have any problems with pay disparities, it seems to me if enough people perceived that their pay was unfair, then Google was doing something wrong in not instilling in its employees a perception of fairness."

Answer the following questions:

1. (2%) Which market structure described in class is the closest to the web search engine market? Explain.
2. (4%) Which kind of discrimination is described here? Taste-based or statistical discrimination? Explain. Can the superstar effect explain such wage inequality? Why or why not?
3. (3%) Why do companies prefer discretion about salaries? Is this an issue of company welfare vs. social welfare? Explain.
4. (4%) Based on what you learned about social economics in class, is it acceptable that two people of the same race (such as white people) receive different wages to do the same job? Is it unfair for cooperates to pay the intern and employee different wage to do the same job? Why or why not?
5. (3%) Is it enough for a company to address objective pay disparities or can perceived disparities among its employees be just as damaging? Explain.
6. (3%) How does California and federal law affect the welfare of Google or other company in the State? Do you think this is beneficial to the employees? Why or why not?