中微习题课材料（六）

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1 Recap and Solution to PS7

1.1 Monopoly（垄断）

- Profit maximization
  - max $r(y)-c(y)$ implies $r'(y) = c'(y)$
  - max $p(y)y-c(y)$ implies $p(y) + p'(y)y = c'(y)$
  - can also write this as

$$p(y)[1 + \frac{dp}{dy}\frac{y}{p}] = c'(y)$$

  - or $p(y)[1 + 1/\epsilon] = c'(y)$
  - **Linear Case**: in case of linear demand, $p = a-by$, marginal revenue is given by $MR = a-2by$

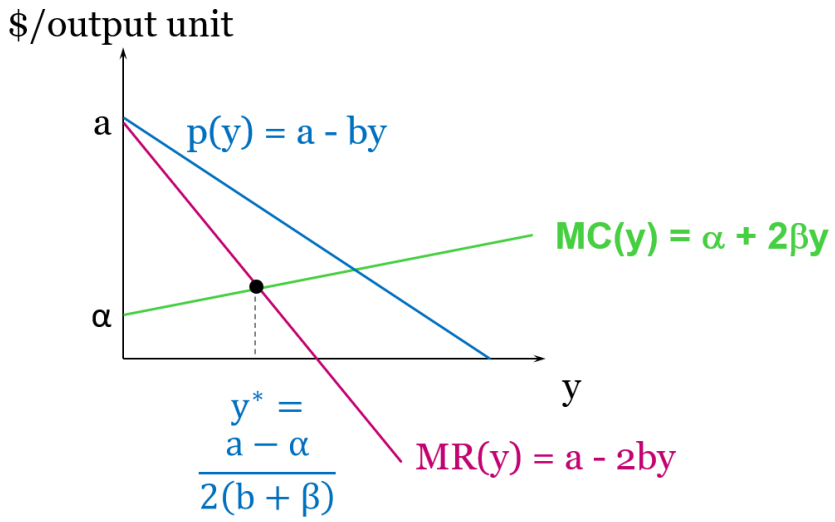

Figure 1: Monopoly

  - **Constant Elasticity**: $q = Ap^{\epsilon}$
    - in this case, $MR = p[1 + 1/\epsilon]$
    - so, optimal condition is $p[1 + 1/\epsilon] = c\,(y)$

    * markup on marginal cost

- Taxes
  - **linear case**: price goes up by half of tax.
  - **log case**: price goes up by more than tax, since price is a markup on MC.

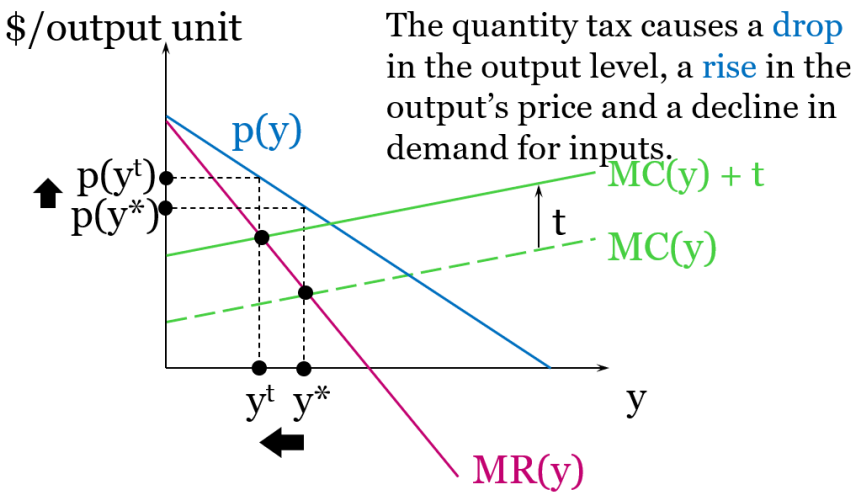

Figure 2: tax

- Inefficiency of monopoly
  - Pareto efficient means no way to make some group better off without hurting some other group
  - Pareto inefficient means that there is some way to make some group better off without hurting some other group
  - monopoly is Pareto inefficient since $P > MC$
  - measure of the deadweight loss: value of lost output

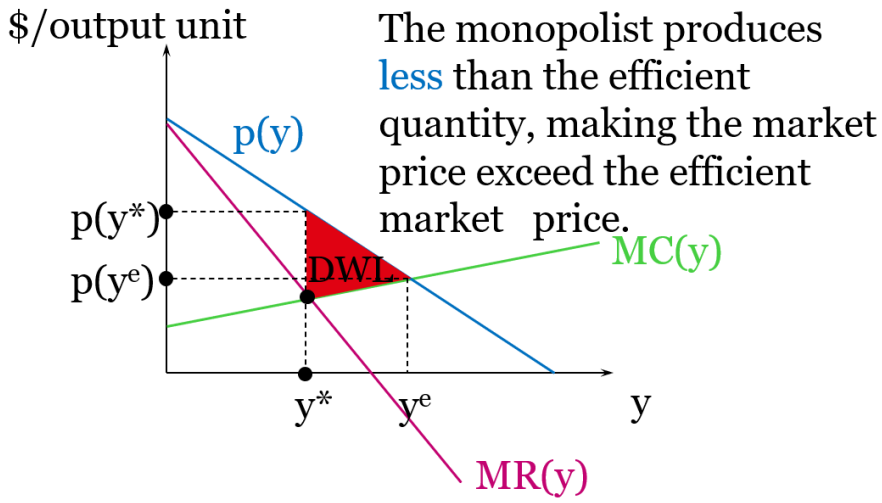

Figure 3: Inefficiency

- **A Quiz** (REVIEW QUESTIONS on the textbook)
  - 7: If the demand curve facing the monopolist has a constant elasticity of 2, then what will be the monopolist's markup on marginal cost?
  - 8: The government is considering subsidizing the marginal costs of the monopolist described in the question above. What level of subsidy should the government choose if it wants the monopolist to produce the socially optimal amount of output?
- Patents
- Natural monopoly
  - public utilities (gas, electricity, telephone) are often thought of as natural monopolies
  - occurs when $p = mc$ is unprofitable —decreasing AC
  - often occurs when fixed costs are big and marginal costs are small
  - how to handle
    - government operates and covers deficit from general revenues
    - regulates pricing behavior so that $price = AC$
- Cause of monopoly

25.4 A monopolist has an inverse demand curve given by $p(y) = 12 - y$ and a cost curve given by $c(y) = y^2$.

a) What will be its profit-maximizing level of output?

3

b) Suppose the government decides to put a tax on this monopolist so that for each unit it sells it has to pay the government \$2. What will be its output under this form of taxation?

2.5

c) Suppose now that the government puts a lump sum tax of \$10 on the profits of the monopolist. What will be its output?

3

25.5 In Gomorrah, New Jersey, there is only one newspaper, the *Daily Calumny*. The demand for the paper depends on the price and the amount of scandal reported. The demand function is $Q = 15S^{1/2}P^{-3}$, where Q is the number of issues sold per day, S is the number of column inches of scandal reported in the paper, and P is the price. Scandals are not a scarce commodity in Gomorrah. However, it takes resources to write, edit, and print stories of scandal. The cost of reporting S units of scandal is $\$10S$. These costs are independent of the number of papers sold. In addition it costs money to print and deliver the paper. These cost \$.10 per copy and the cost per unit is independent of the amount of scandal reported in the paper. Therefore the total cost of printing Q copies of the paper with S column inches of scandal is $\$10S + .10Q$.

(a) Calculate the price elasticity of demand for the *Daily Calumny*. -3 Does the price elasticity depend on the amount of scandal reported? No. Is the price elasticity constant over all prices? Yes.

(b) Remember that $MR = P(1 + \frac{1}{\epsilon})$. To maximize profits, the *Daily Calumny* will set marginal revenue equal to marginal cost. Solve for the profit-maximizing price for the *Calumny* to charge per newspaper. \$.15 When the newspaper charges this price, the difference between the price and the marginal cost of printing and delivering each newspaper is \$.05

(c) If the *Daily Calumny* charges the profit-maximizing price and prints 100 column inches of scandal, how many copies would it sell? (Round to the nearest integer.) $44,444$ Write a general expression for the number of copies sold as a function of S: $Q(S) = Q = 15S^{1/2}(.15)^{-3} = 4,444.44S^{1/2}$

(d) Assuming that the paper charges the profit-maximizing price, write an expression for profits as a function of Q and S. $Profits = .15Q - .10Q - 10S$ Using the solution for $Q(S)$ that you found in the last section, substitute $Q(S)$ for Q to write an expression for profits as a function of S alone. $Profits = .05(4,444.44S^{1/2}) - 10S = 222.22S^{1/2} - 10S$

(e) If the *Daily Calumny* charges its profit-maximizing price, and prints the profit-maximizing amount of scandal, how many column inches of scandal should it print? 123.456 inches. How many copies are sold $49,383$ and what is the amount of profit for the *Daily Calumny* if it maximizes its profits? $1,234.5$

1.2 Monopoly Behaviour（垄断行为）

- Price Discrimination（价格歧视）
  - first degree: perfect price discrimination
    - gives Pareto efficient output
    - same as take-it-or-leave-it offer
    - producer gets all surplus
  - second degree: nonlinear pricing
    - two demand curves

* would like to charge each full surplus
* but have to charge bigger one less to ensure self-selection
* but then want to reduce the amount offered to smaller consumer

– third degree: most common

$$max\, p_1(y_1)y_1 + p_2(y_2)y_2 - c(y_1 + y_2)$$

* gives us the first-order conditions

$$p_1 + p_{\ 1}(y_1)y_1 = c\,(y_1 + y_2) \qquad p_2 + p_{\ 2}(y_2)y_2 = c\,(y_1 + y_2)$$

* or

$$p_1[1 - \frac{1}{|\epsilon_1|}] = MC$$

$$p_2[1 - \frac{1}{|\epsilon_2|}] = MC$$

* result: if $p_1 > p_2$, then $|\epsilon_1| < |\epsilon_2|$
* more elastic users pay lower prices

	Integrated market	Segmented market
Linear pricing	uniform pricing	3rd degree
Nonlinear pricing	2nd degree	1st degree

Figure 4: price discrimination

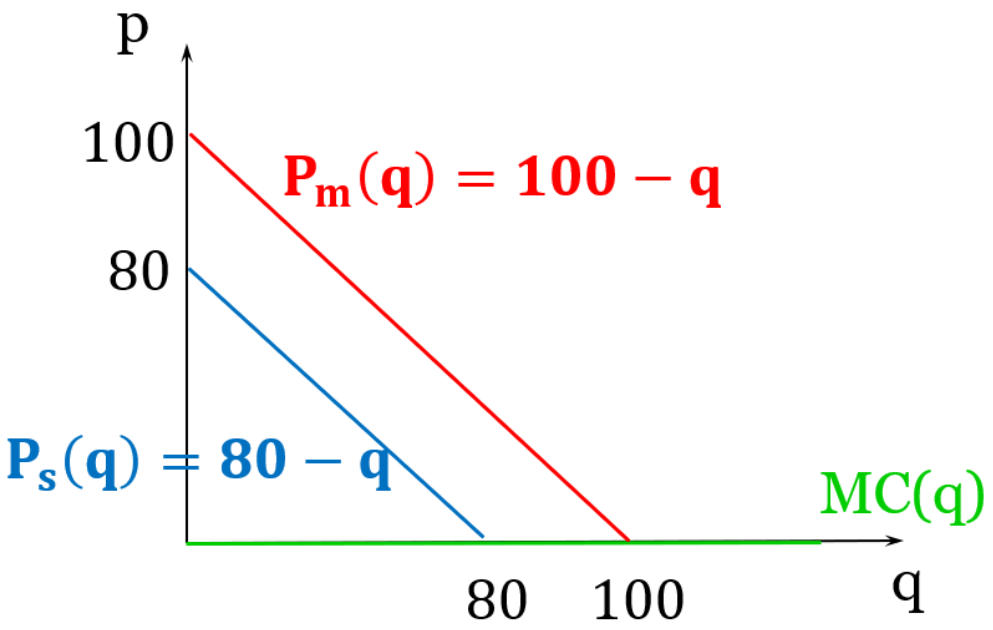

Figure 5: first price discrimination

First: The company sells 80-article to the student for \$32 and 100-article to the manager for \$50 (take-it-or-leave-it offers).

Second: Two packages: one is (q_1=80, p_1=\$32), the other is (q_2=100, p_2=\$34).

Second: There are many other package bundles: another one is (q_1=60, p_1=\$30), the other is (q_2=100, p_2=\$38).

Third: for managers, p_m=\$50, for students, p_s=\$40.

- Two-part tariffs
  - what happens if everyone is the same?
  - entrance fee = full surplus
  - usage fee = marginal cost

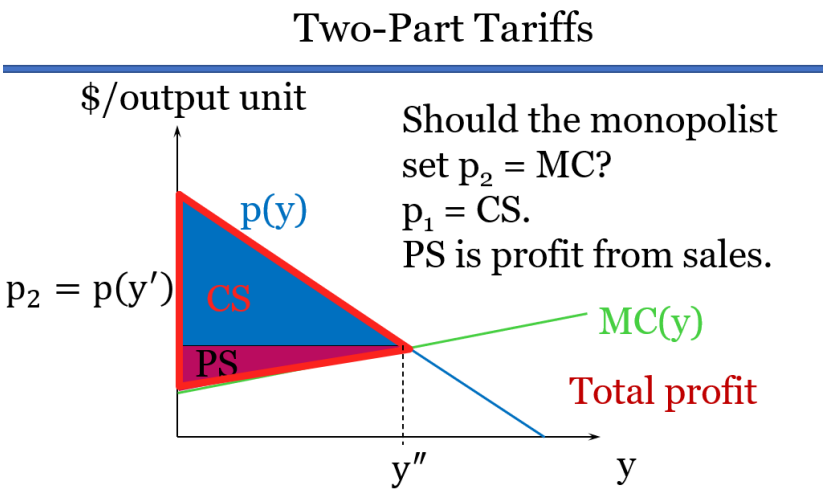

Figure 6: two-part tariffs

- **A Quiz**

  Suppose that 1500 people are interested in attending ElvisLand. Once a person arrives at Elyis-Land, his or her demand for rides is given by $x = MAX\{4 - p, 0\}$ where p is the price per ride. There is a constant marginal cost of \$2 for providing a ride at Elvisland. If ElvisLand charges a profit-maximizing two-part tariff. with one price for admission to ElyisLand and another price perride for those who get in. How much should it charge per ride and how much for admission?

26.5 The Grand Theater is a movie house in a medium-sized college town. This theater shows unusual films and treats early-arriving movie goers to live organ music and Bugs Bunny cartoons. If the theater is open, the owners have to pay a fixed nightly amount of \$500 for films, ushers（引座员）, and so on, regardless of how many people come to the movie.

For simplicity, assume that if the theater is closed, its costs are zero. The nightly demand for Grand Theater movies by students is $Q_S = 220-40P_S$, where Q_S is the number of movie tickets demanded by students at price P_S. The nightly demand for nonstudent moviegoers is $Q_N = 140-20P_N$.

(a) If the Grand Theater charges a single price, P_T, to everybody, then at prices between 0 and \$5.50, the aggregate demand function for movie tickets is $Q_T(P_T) = 360-60P_T$. Over this range of prices, the inverse demand function is then $P_T(Q_T) = 6-Q_T/60$.

(b) What is the profit-maximizing number of tickets for the Grand Theater to sell if it charges one price to everybody? 180. At what price would this number of tickets be sold? \$3. How much profits would the Grand make? \$40. How many tickets would be sold to students? 100. To nonstudents? 80.

(c) Suppose that the cashier can accurately separate the students from the nonstudents at the door by making students show their school ID cards. Students cannot resell their tickets and nonstudents do not have access to student ID cards. Then the Grand can increase its profits by charging students and nonstudents different prices. What price will be charged to students? \$2.75. How many student tickets will be sold? 110. What price will be charged to nonstudents? \$3.50. How many nonstudent tickets will be sold? 70. How much profit will the Grand Theater make? \$47.50.

(d) If you know calculus, see if you can do this part. Suppose that the Grand Theater can hold only 150 people and that the manager wants to maximize profits by charging separate prices to students and to nonstudents. If the capacity of the theater is 150 seats and Q_S tickets are sold to students, what is the maximum number of tickets that can be sold to nonstudents? $Q_N = 150 - Q_S$. Write an expression for the price of nonstudent tickets as a function of the number of student tickets sold. (Hint: First find the inverse nonstudent demand function.) $P_N = -1/2 + Q_S/20$. Write an expression for Grand Theater profits as a function of the number Q_S only. (Hint: Make substitutions using your previous answers.)

$Q_S(11/2 - Q_S/40) + (-1/2 + 20/Q_S)(150 - Q_S) - 500 = -3Q_S^2/40 + 27Q_S/2 - 575$.

How many student tickets should the Grand sell to maximize profits? 90. What price is charged to students? \$3.25. How many nonstudent tickets are sold? 60. What price is charged to nonstudents? \$4. How much profit does the Grand make under this arrangement? \$32.50.

26.7 Bill Barriers, CEO of MightySoft software, is contemplating a new marketing strategy: bundling their best-selling wordprocessor（文字处理器）and their spreadsheet（电子表格）together and selling the pair of software products for one price.

From the viewpoint of the company, bundling software and selling it at a discounted price has two effects on sales: 1) revenues go up due to additional sales of the bundle; and 2) revenues go down since there is less of a demand for the individual components of the bundle.

The profitability of bundling depends on which of these two effects dominates. Suppose that MightySoft sells the wordprocessor for \$200 and the spreadsheet for \$250. A marketing survey of 100 people who purchased either of these packages in the last year turned up the following facts:

- 20 people bought both.
- 40 people bought only the wordprocessor. They would be willing to spend up to \$120 more for the spreadsheet.
- 40 people bought only the spreadsheet. They would be willing to spend up to \$100 more for the wordprocessor.

In answering the following questions you may assume the following:

- New purchasers of MightySoft products will have the same characteristics as this group.
- There is a zero marginal cost to producing extra copies of either software package.
- There is a zero marginal cost to creating a bundle.

(a) Let us assume that MightySoft also offers the products separately as well as bundled. In order to determine how to price the bundle, Bill Barriers asks himself the following questions. In order to sell the bundle to the wordprocessor purchasers, the price would have to be less than $200 + 120 = 320$.

(b) In order to sell to the spreadsheet users, the price would have to be less than $250 + 100 = 350$.

(c) What would MightySoft's profits be on a group of 100 users if it priced the bundle at \$320? Everyone buys the bundle so profits are $100 \times 320 = \$32,000$.

(d) What would MightySoft's profits be on a group of 100 users if it priced the bundle at \$350? 20 people would buy both anyway, 40 people bought spreadsheet only and would be willing to

buy the bundle, 40 people buy the wordprocessor, but not the spreadsheet. Total profits are $20\times350 + 40 \times 350 + 40 \times 200 = 29,000$.

(e) If MightySoft offers the bundle, what price should it set? $320 is the more profitable price.

(f) What would profits be without offering the bundle? Without the bundle, profits would be $20 \times (200 + 250) + 40 \times 200 + 40 \times 250 = 27,000$.

(g) What would be the profits with the bundle? $100 \times 320 = 32,000$

(h) Is it more profitable to bundle or not bundle? bundle.

(i) Suppose that MightySoft worries about the reliability of their market survey and decides that they believe that without bundling t of the 100 people will buy both products, and $(100-t)/2$ will buy the wordprocessor only and $(100-t)/2$ will buy the spreadsheet only. Calculate profits as a function of t if there is no bundling. $225 \times (100-t) + 450 \times t$.

(j) What are profits with the bundle? $32000.

(k) At what values of t would it be unprofitable to offer the bundle? Solve for the t that equates the two profits to find $t = 42.22$. So if more than 42 of the 100 new purchasers would buy both products anyway, it is not profitable to bundle them.

(l) This analysis so far has been concerned only with customers who would purchase at least one of the programs at the original set of prices. Is there any additional source of demand for the bundle? What does this say about the calculations we have made about the profitability of bundling? Yes, it may be that there are some consumers who were not willing to pay $200 for the wordprocessor or $250 for the spreadsheet, but would be willing to pay $320 for the bundle. This means that bundling would be even more profitable than the calculations above indicate.

EQ11 Monovino is a potential start-up. They can create an algorithm that determines a consumer's ideal bottle of wine from a quiz, in which a consumer answers questions about her tastes. Suppose that it would cost Monovino $100 to create the algorithm and $6 for each personalized bottle of wine they produce. These are Monovino's only costs, and they are a monopolist in the personalized wine industry. If they form the start-up, Monovino will use the following pricing strategy. Consumers pay a one-time fee of $\$F$ to take the quiz and pay $\$p$ per bottle of personalized wine. The inverse demand function for personalized wine is $p(y) = 30 - 2y$. To maximize profits, what quiz fee, F, and per bottle price, p, would Monovino choose? Would they choose to create the algorithm and form the start-up?

Now, suppose that the government enacts a tax of $2 on each bottle of personalized wine sold. Find the new profit maximizing quiz fee, per bottle price, and Monovino's profit. What is the lowest tax, T, per bottle sold, such that Monovino would choose not to create the algorithm and form the start-up? Please show your work and explain your answers.

Monovino is using a two-part tariff pricing strategy: each customer's inverse demand for personalized wine is $p(y) = 30 - 2y$. Start by solving for the price per bottle of wine. With a two-part tariff, the monopolist sets $p = MC = 6$. Next, the firm will set the fixed fee (quiz fee) equal to the consumer surplus from buying wine at the per-unit price it sets. To calculate consumer surplus, given that we already know $p = 6$, we need the quantity demanded. Plugging $p = 6$ into the inverse-demand function gives $y = 12$. The consumer surplus, then, is the area of a triangle with height $30 - 6 = 24$ (which comes from p-intercept 30 and $p = 6$) and base 12 (the quantity demanded). Thus, the area of the triangle, the consumer surplus, and hence the fixed fee that

maximizes Monovino's profit is $F = 144$. With this pricing strategy, the firm breaks even on each bottle sold and has revenue per customer equal to the fixed fee charged to each customer. The revenue is greater than the cost of creating the algorithm for each customer ($100), and so the group should form the start-up.

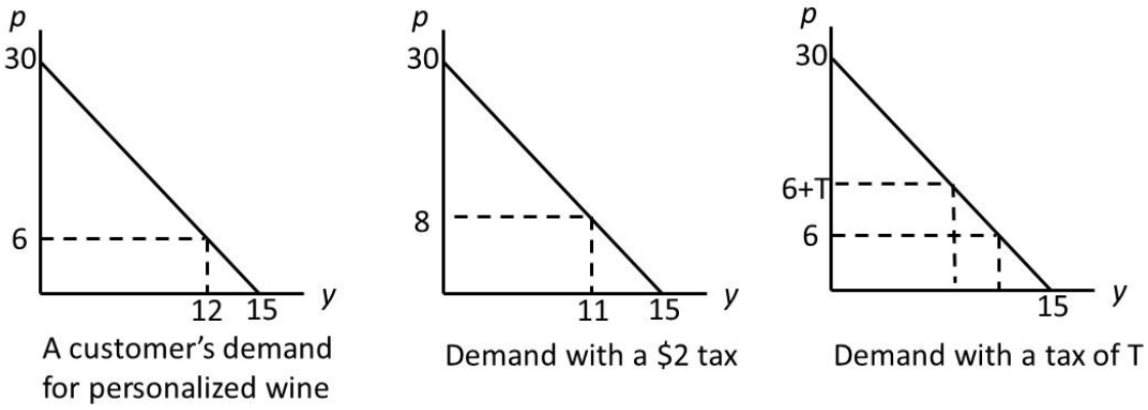

Figure 7: EQ11

If a tax of $2 per-bottle is imposed on Monovino, this may be viewed simply as raising the marginal cost to $8. Using the same steps as above, we get that the profit-maximizing per-bottle price is $p = 8$, the quantity demanded is $y = 11$, the fixed fee is F = 121, and profit per customer is $21.

To find the lowest tax rate at which Monovino decides not to create the algorithm and form the start-up, we look for the condition under which Monovino makes zero profit. Monovino's profit per customer is revenue minus the cost of creating the algorithm and processing the quiz results, $100. Monovino's revenue is equal to the fixed fee, and the fixed fee is equal to consumer surplus. Therefore, we are looking for what tax T would yield a consumer surplus of 100, giving a profit of zero. We know that Monovino would choose a per-bottle price equal to marginal cost, which with a tax, T, gives $p = 6 + T$. The quantity demanded would then be $y = (0.5)(24 - T)$.

Consumer surplus would be the area of a triangle with height $30 - (6 + T) = 24 - T$ and base $(0.5)(24 - T)$. Hence, the area of the triangle, and thus the fixed fee, would be $F = (0.25)(24 - T)(24 - T)$. Again, we are looking for when $F = 100$. Solving for the tax that gives $F = (0.25)(24 - T)(24 - T) = 100$, we get $T = 4$.

1.3 General Equilibrium（一般均衡）

- Edgeworth box
  - allocation
  - feasible allocation
  - consumption bundles
  - initial endowment
  - final allocation
  - contract curve

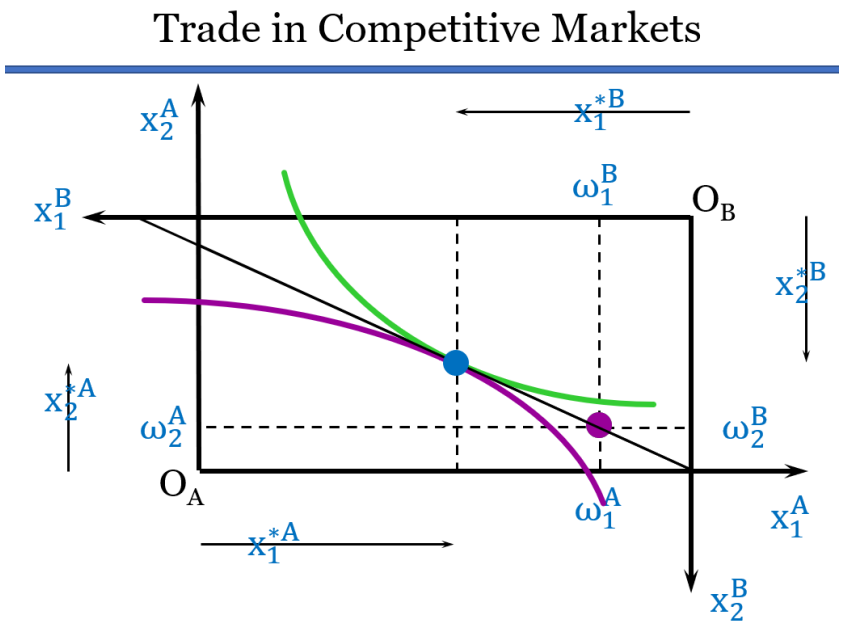

Figure 8: EQ11

- Pareto efficient allocations
  - where trade stops —no mutual improvement possible
  - Pareto efficient —no way to make both people better off
  - indifference curves must be tangent
  - Pareto set, or contract curve —locus of all PE points
- Market trade
  - specific way to trade —using price system
  - gross demands and net demands
  - market equilibrium —where supply equals demand
- Efficiency
  - does the market exhaust all the gains from trade?
  - is the market outcome efficient?
  - **First Theorem of Welfare Economics**: yes（在一个完全竞争的经济体中，若消费者具有良性偏好，信息完全，不存在外部性，那么该经济体存在着一般均衡，且均衡下的资源配置是帕累托最优的，Adam Smith's invisible hand）
  - is any efficient allocation a market equilbrium?
  - **Second Theorem of Welfare Economics**: yes, if things are appropriately convex （如果允许对初始禀赋进行一次再分配，那么任何一个帕累托最优分配都可以由竞争性市场均衡来实现）

– **Walras's law**: if each individual satisfies his or her budget constraint, then the market as a whole must satisfy its budget constraint (If consumers' preferences are well-behaved, then the aggregate value of all excess demand in an economy is identically zero.)

32.4 A little exchange economy has just two consumers, named Ken and Barbie, and two commodities, quiche（蛋奶馅饼）and wine. Ken's initial endowment is 3 units of quiche and 2 units of wine. Barbie's initial endowment is 1 unit of quiche and 6 units of wine. Ken and Barbie have identical utility functions. We write Ken's utility function as, $U(Q_K, W_K) = Q_K W_K$ and Barbie's utility function as $U(Q_B, W_B) = Q_B W_B$, where Q_K and W_K are the amounts of quiche and wine for Ken and Q_B and W_B are amounts of quiche and wine for Barbie.

(a) Draw an Edgeworth box below, to illustrate this situation. Put quiche on the horizontal axis and wine on the vertical axis. Measure goods for Ken from the lower left corner of the box and goods for Barbie from the upper right corner of the box. (Be sure that you make the length of the box equal to the total supply of quiche and the height equal to the total supply of wine.) Locate the initial allocation in your box, and label it W. On the sides of the box, label the quantities of quiche and wine for each of the two consumers in the initial endowment.

(b) Use blue ink to draw an indifference curve for Ken that shows allocations in which his utility is 6. Use red ink to draw an indifference curve for Barbie that shows allocations in which her utility is 6.

(c) At any Pareto optimal allocation where both consume some of each good, Ken's marginal rate of substitution between quiche and wine must equal Barbie's. Write an equation that states this condition in terms of the consumptions of each good by each person.

$W_B/Q_B = W_K/Q_K$.

(d) On your graph, show the locus (中心) of points that are Pareto efficient. (Hint: If two people must each consume two goods in the same proportions as each other, and if together they must consume twice as much wine as quiche, what must those proportions be?)

(e) In this example, at any Pareto efficient allocation, where both persons consume both goods, the slope of Ken's indifference curve will be -2.

Therefore, since we know that competitive equilibrium must be Pareto efficient, we know that at a competitive equilibrium, $p_Q/p_W = 2$.

(f) In competitive equilibrium, Ken's consumption bundle must be 2 quiche, 4 wine.

How about Barbie's consumption bundle? 2 quiche, 4 wine.

(Hint: You found competitive equilibrium prices above. You know Ken's initial endowment and you know the equilibrium prices. In equilibrium Ken's income will be the value of his endowment at competitive prices. Knowing his income and the prices, you can compute his demand in competitive equilibrium. Having solved for Ken's consumption and knowing that total consumption by Ken and Barbie equals the sum of their endowments, it should be easy to find Barbie's consumption.)

(g) On the Edgeworth box for Ken and Barbie, draw in the competitive equilibrium allocation and draw Ken's competitive budget line (with black ink).

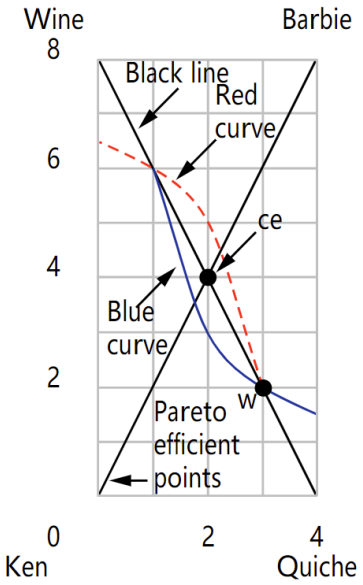

Figure 9: The Figure of 32.4

- **A Quiz**

  In this problem, Ken's utility function is $U(Q_K, W_K) = Q_K W_K$ and Barbie's utility function is $U(Q_B, W_B) = Q_B W_B$. If Ken's initial endowment were 4 units of quiche and 6 units of wine and Barbie's endowment were 8 units of quiche and 6 units of wine, then at any Pareto optimal allocation where both persons consume some of each good,

  (a) Ken would consume 4 units of quiche for every 6 units of wine.

  (b) Barbie would consume twice as much quiche as Ken.

  (c) Ken would consume 12 units of quiche for every 12 units of wine that he consumes.

  (d) Barbie would consume 8 units of quiche for every 6 units of wine that she consumes.

  (e) None of the other options are correct.

32.5 Linus Straight's utility function is $U(a, b) = a + 2b$, where a is his consumption of apples and b is his consumption of bananas. Lucy Kink's utility function is $U(a, b) = min\{a, 2b\}$. Lucy initially has 12 apples and no bananas. Linus initially has 12 bananas and no apples. In the Edgeworth box below, goods for Lucy are measured from the upper right corner of the box and goods for Linus are measured from the lower left corner. Label the initial endowment point on the graph with the letter E. Draw two of Lucy's indifference curves in red ink and two of Linus's indifference curves in blue ink. Use black ink to draw a line through all of the Pareto optimal allocations.

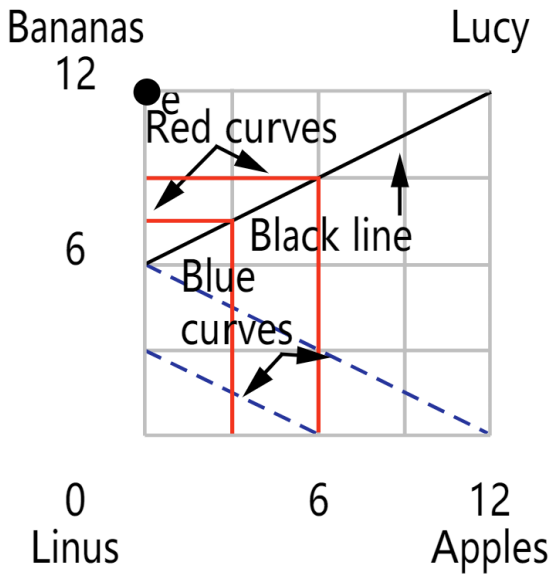

Figure 10: The Figure of 32.5

(a) In this economy, in competitive equilibrium, the ratio of the price of apples to the price of bananas must be 1/2.

(b) Let a_S be Linus's consumption of apples and let b_S be his consumption of bananas. At competititive equilibrium, Linus's consumption will have to satisfy the budget constraint, $a_S + 2b_S = 24$. This gives us one equation in two unknowns. To find a second equation, consider Lucy's consumption. In competitive equilibrium, total consumption of apples equals the total supply of apples and total consumption of bananas equals the total supply of bananas. Therefore Lucy will consume $12-a_S$ apples and $12-b_S$ bananas. At a competitive equilibrium, Lucy will be consuming at one of her kink points. The kinks occur at bundles where Lucy consumes 2 apples for every banana that she consumes. Therefore we know that $\frac{12-a_S}{12-b_S} = 2$.

(c) You can solve the two equations that you found above to find the quantities of apples and bananas consumed in competitive equilibrium by Linus and Lucy. Linus will consume 6 units of apples and 9 units of bananas. Lucy will consume 6 units of apples and 3 units of bananas.

32.7 Charlotte loves apples and hates bananas. Her utility function is $U(a,b) = a-\frac{1}{4}b^2$, where a is the number of apples she consumes and b is the number of bananas she consumes. Wilbur likes both apples and bananas. His utility function is $U(a,b) = a + 2\sqrt{b}$. Charlotte has an initial endowment of no apples and 8 bananas. Wilbur has an initial endowment of 16 apples and 8 bananas.

(a) On the graph below, mark the initial endowment and label it E. Use red ink to draw the indifference curve for Charlotte that passes through this point. Use blue ink to draw the indifference curve for Wilbur that passes through this point.

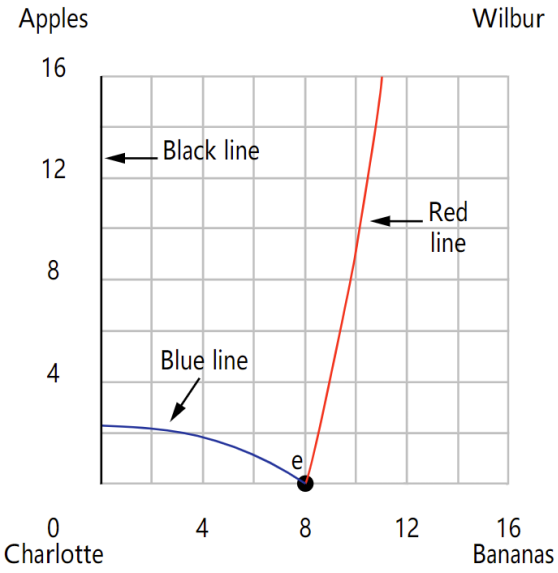

Figure 11: The Figure of 32.7

(b) If Charlotte hates bananas and Wilbur likes them, how many bananas can Charlotte be consuming at a Pareto optimal allocation? 0. On the graph above, use black ink to mark the locus of Pareto optimal allocations of apples and bananas between Charlotte and Wilbur.

(c) We know that a competitive equilibrium allocation must be Pareto optimal and the total consumption of each good must equal the total supply, so we know that at a competitive equilibrium, Wilbur must be consuming 16 bananas. If Wilbur is consuming this number of bananas, his marginal utility for bananas will be 1/4 and his marginal utility of apples will be 1. If apples are the *numeraire*, then the only price of bananas at which he will want to consume exactly 16 bananas is 1/4. In competitive equilibrium, for the Charlotte-Wilbur economy, Wilbur will consume 16 bananas and 14 apples and Charlotte will consume 0 bananas and 2 apples.

EQ13 Albert has a utility function for goods X and Y given by $u_A(X_A, Y_A) = X_A + 2Y_A$, while Beatrice's utility function is $u_B(X_B, Y_B) = min\{2X_B + Y_B\}$. Suppose that Albert's endowment is $(X_A^\epsilon, Y_A^\epsilon) = (6, 5)$, and Beatrices's endowment is $(X_B^\epsilon, Y_B^\epsilon) = (4, 3)$. Sketch the Edgeworth box with X on the horizontal axis and Y on the vertical axis, and with Albert's origin in the lower left and Beatrice's origin in the upper right. Indicate the endowment point and sketch in the indifference curves through the endowment. Indicate the set of Pareto Efficient points. What does Pareto efficiency tell you about the equilibrium price ratio? Calculate the competitive equilibrium, and graph in the budget line and indicate the equilibrium allocation in your sketch.

Because competitive equilibria are Pareto efficient, Albert must be consuming some of each good. Since his preferences are perfect substitutes, Albert is willing to do this only if the budget line has the same slope as his indifference curves: $\frac{MU_X^A}{MU_Y^A} = \frac{1}{2} = \frac{P_X}{P_Y}$. If we consider X to be the numeraire, then $P_X = 1$ and $P_Y = 2$ in equilibrium. Because Beatrice's preferences are perfect complements, she will optimally consume along her line of kinks: $Y_B = 2X_B$, which is also the line of Pareto efficient points. Beatrice's budget equation is $1 \cdot X_B + 2 \cdot Y_B = 1 \cdot 4 + 2 \cdot 3 = 10$. Substituting her optimality condition into the budget equation tells us that X_B^* and Y_B^*, so that $X_A^* = 8$ and $Y_A^* = 4$.

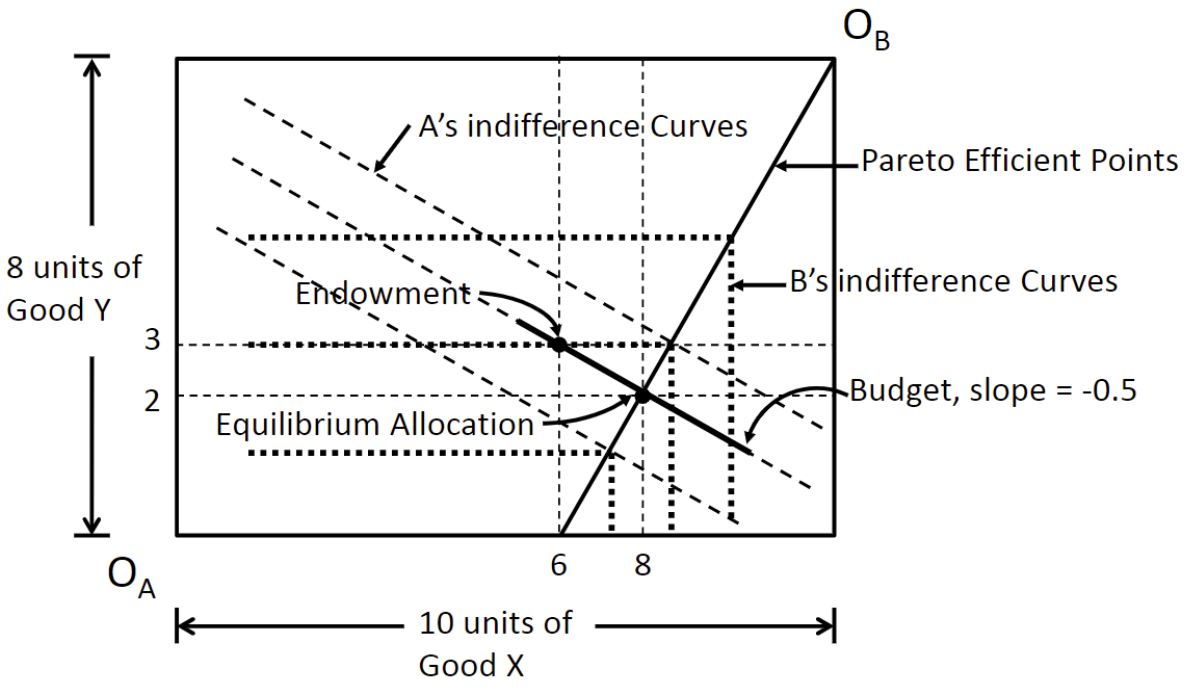

Figure 12: EQ13 (wrong version)

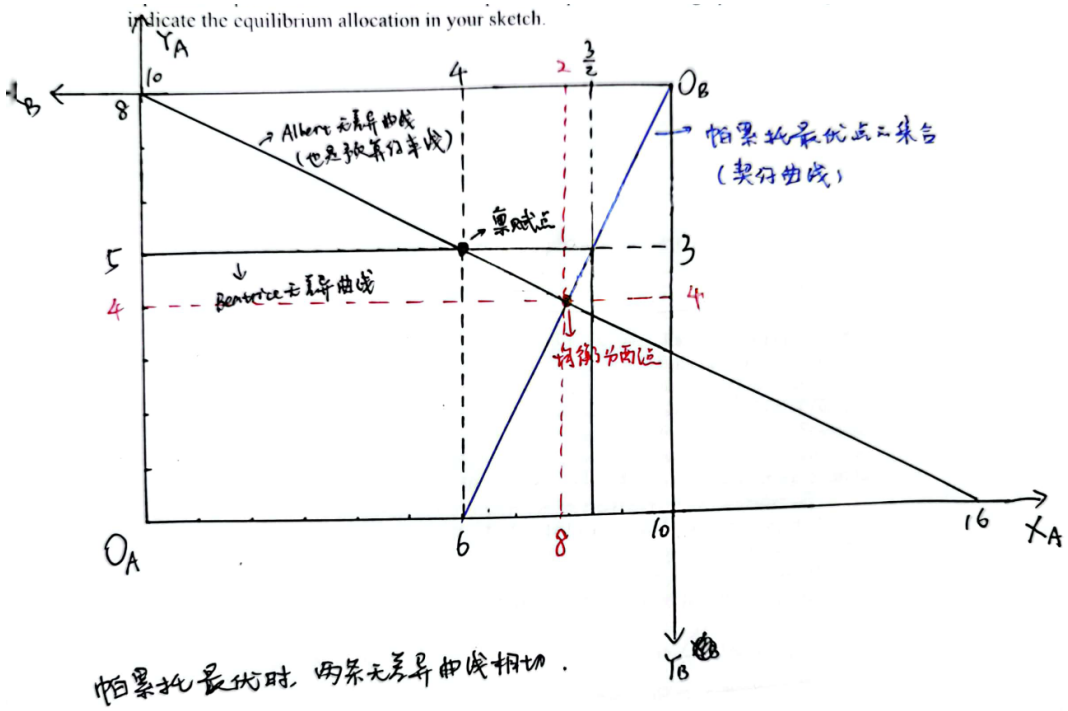

Figure 13: EQ13 (right version, from one of our students)

2 Supplement Materials

2.1 Questions

1 **Monopoly:** A firm has invented a new beverage called Slops. It doesn't taste very good, but it gives people a craving for Lawrence Welk's music and Professor Johnson's jokes. Some people are willing to pay money for this effect, so the demand for Slops is given by the equation $q = 18 - p$. Slops canbe made at zero marginal cost from old-fashioned macroeconomics books dissolved in bathwater. But before any Slops can be produced, the firm must undertake a fixed cost of 86. Since the inventor has a patent on Slops, it can be a monopolist in this new industry.

(a)The firm will produce 9 units of Slops.

(b) A Pareto improvement could be achieved by having the governrment pay the firm a subsidy of 91 and insisting that the firm offer Slops at zero price.

(c) From the point of view of social efficiency, it is best that no Slops be produced.

(d) The frm will produce 18 units of Slops.

(e) None of the other options are correct.

2 **Monopoly:** A proft-maximizing monopoly faces an inverse demand function described by the equation $p(y) = 60 - y$ and its total costs are $c(y) = 10y$, where prices and costs are measured in dollars. In the past it was not taxed, but now it must pay a tax of 6 dollars per unit of output. After the tax, the monopoly will

(a) increase its price by 6

(b) increase its price by 9

(c) increase its price by 3

(d) leave its price constant

(e) None of the other options are correct

3 **Monopoly Behavior:** A price-discrimi nating monopolist sells in two separate markets such that goods sold in one market are never resold in the other. It charges 6 in one market and 12 in the other market. At these prices, the price elasticity in the first market is -2.40 and the price elasticity in the second market is -0.70. Which of the following actions is sure to raise the monopolist's profits?

(a) Lower p_2

(b) Raise p_2

(c) Raise p_1 and lower p_2

(d) Raise both p_1 and p_2

(e) Raise p_2 and lower p_1

4 **Exchange:** An economy has two people Charlie and Doris. There are two goods, apples and bananas. Charlie has an initial endowment of 7 apples and 8 bananas. Doris has an initial endowment of 14 apples and 4 bananas. Charlie's utility function is $U(A_C, B_C) = A_C B_C$ where A_C is his apple consumption and B_C is his banana consumption. Doris's utility function is $U(A_D, B_D) = A_D B_D$ where A_D and B_D are her apple and banana consumptions. At every Pareto optima allocation,

(a) Charlie consumes the same number of apples as Doris

(b) Charlie consumes 21 apples for every 12 bananas that he consumes

(c) Doris consumes equal numbers of apples and bananas

(d) Charlie consumes more bananas per apple than Doris does

(e) Doris consumes apples and bananas in the ratio of 14 apples for every 4 bananas that she consumes

5 **Exchange:** Professor Nightsoil's utility function is $U_N(B_N, P_N) = B_N + 4P_N^{1/2}$ and Dean Interface's utility function is $U_I(B_I, P_I) = B_I + 2P_I^{1/2}$. If Nightsoil's initial endowment is 6 bromides and 20 platitudes and if Interface's initial endowment is 2 bromides and 10 platitudes, then at any Pareto efficient allocation where both persons consume positive amounts of both goods, it must be that

(a) Nightsoil consumes the same ratio of bromides to platitudes as Interface.

(b) Interface consumes 6 platitudes.

(c) Interface consumes 4 bromides.

(d) Interface consumes 4 bromides.

(e) Interface consumes 2 platitudes.

2.2 Final Exam Notes

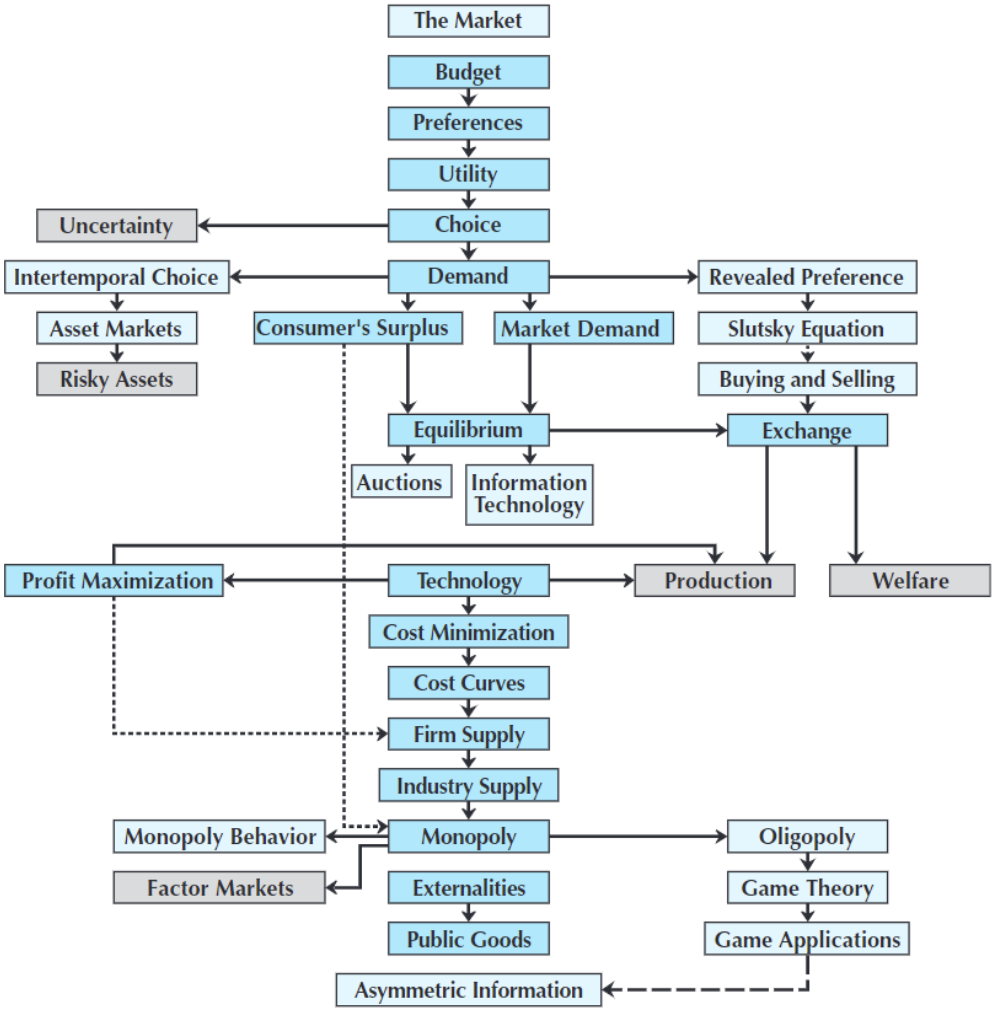

Figure 14: There Are Many Paths to Economic Enlightenment

The darker colored chapters are "core" chapters—they should probably be covered in every intermediate microeconomics course. The lighter-colored chapters are "optional" chapters: I cover some but not all of these every semester. The gray chapters are chapters I usually don't cover in my course, but they could easily be covered in other courses. A solid line going from Chapter A to Chapter B means that Chapter A should be read before chapter B. A broken line means that Chapter B requires knowing some material in Chapter A, but doesn't depend on it in a significant way.

- **期末考试时间**：2023 年 6 月 20 日下午（具体地点和时间待定，会在微信群和教学网通知大家）
- **考试范围**：从均衡到寡头（大纲里的最后一章信息不对称不考）
- **题型**：单选 + 简答计算题

谢谢同学们一学期以来的支持！祝大家期末顺利！！！