

Local newspapers were among the first applicants in many cities to seek licenses for television broadcasting channels in their cities. Local newspapers were (and still are) monopolies in the sale of certain products like local print advertising; in the beginning many television broadcasting stations were monopolists in the supply of TV advertising. How did such newspapers stand to profit more than other applicants from the broadcast licenses?

The answer can be found with some simple analysis. Let the demand for different products 1 and 2 be $q_1 = 10 - 2p_1 + p_2$ and $q_2 = 10 + p_1 - 2p_2$ where q_i and p_i represent the respective quantity demanded and price of the i th good. Assume production costs for both goods are zero.

a. Calculate the prices that two separate monopolies would charge when each regards the other's price as beyond its control. (To do this, find the profit maximizing behavioral equation for each firm operating separately. Because p_i will be a function of p_j , the behavioral equations of independent monopolists must be solved simultaneously.)

b. Calculate the prices that a single monopolist of both goods would charge for each and show that the prices are different and profits are higher than is the case in (a) above. (Again, find the behavioral equations or first order conditions for the single, joint profit maximizing monopolist. Here the first order conditions will involve two equations that must be solved simultaneously. However, the equations are different when one firm operates both businesses.)

1. If kumquats are an inferior good, the demand curve for kumquats has a positive slope.
2. Suppose SuperMart builds a new store next to the town of Central. Also suppose that the result is to make all land in Central more valuable in commercial (business) uses than before, but to make all land in Central less value in residential uses. TFU: As a result of the new SuperMart store, residents of Central will devote fewer resources to maintaining their homes (e.g., they will paint them less often, are less likely to repair broken gutters or windows, etc.).
3. The greater the number of “middlemen” within a supply chain, the higher will be the final cost of a consumer product.
4. If a competitive firm has the production function is $X = AL\alpha$, then the elasticity of the firm's demand for labor is equal to $1/\alpha$.
5. Suppose Octopus Manufacturing has two plants, A and B. For any given level of output, costs are lower if the output is produced at plant A. TFU: Octopus will operate only plant A.
6. Because all costs can be avoided in the long run but not the short run, long run marginal costs can never be higher than short run marginal costs

1. A single plant monopolist may operate in the declining portion of its long run average cost curve, but will always operate at the minimum of its short run average cost curve.
2. Recently New York City Transit Authority began offering free bus-to-subway transfers. The result was an increase in revenue of 4 percent and an increase of 17 percent in riders. This proves that demand is elastic.
3. Long run costs are always greater than short run costs, because in the short run some costs can be avoided.
4. In an industry whose firms produce under conditions of increasing returns to scale, it is not possible to pay each factor of production the value of its marginal product.
5. History and current experience suggest that rental car fees are regularly lower in Florida than the rest of the nation. For instance, Alamo is currently renting cars for \$25 per day in Florida and \$29 per day in all the rest of the nation where they have outlets. Why is it that rental car prices are regularly lower in Florida than in the rest of the United States? Develop a theoretical explanation and a way of testing your explanation.
6. A perfectly competitive firm is less likely to discriminate against women or minorities in its hiring and promotion practices than is a monopolist.
7. The market supply curve in a competitive industry must be perfectly elastic if all firms are identical.
8. Fixed costs are irrelevant to output decisions.
9. Historically, many people work in the underground turquoise mining industry have died prematurely of “blue lung disease,” caused by turquoise dust in the air that circulates in the mines. New technology that filters out 100% of the dust has been developed and introduced into the mines.
TFU: Because most workers already suffer from the disease, the new safer technology will not immediately lead to any reduction in the compensating wage differential associated with the hazards of blue lung disease.
10. TFU: If all firms in a competitive industry use a production technology that is linearly homogeneous, then the long-run supply curve of that industry is horizontal.
11. Mike’s Meat Shoppe engages in third-degree price discrimination in selling pork chops to its two customers, the Old and the Young. The two groups have different demands for pork shops, but each group’s demand curve is linear.
TFU: If the wholesale price of pork chops (paid by Mike) falls, the difference between the retail prices Mike charges to the two groups will increase.
12. TFU: An income tax distorts the choice between labor and leisure, while a general sales tax distorts the choice between consumption and saving.

1. Suppose there are two restaurant chains that are identical except that A buys its potatoes in the spot market, paying whatever price prevails at the moment of purchase while B has entered into a long-term contract with a potato supplier at a fixed price. TFU: An increase in the spot price of potatoes will cause A, but not B, to increase the prices at which it sells its french-fried potatoes.
2. A firm that discriminates against minorities in its hiring practices will have higher costs of production than it would if it did not discriminate.
3. "Nobody who works for somebody else ever got overpaid." --Babe Ruth
4. Until this past semester, each custodian in Sistine Hall was assigned to a particular department. Now the custodial staff is randomly assigned to different locations each week. TFU: It is likely that both the level of effort by the custodians and the amount of cash given to them by faculty members as Christmas gifts have gone down this year compared to previous years.
5. Long run costs must be higher than short run costs, because short run costs do not include the cost of capital.
6. Consider a hypothetical country with two regions, North and South. The climate in the North is ill-suited to outdoor activities most of the year, while the climate in the South is well-suited to such activities for most of the year.
TFU: If workers (and firms) can move between the two regions at relatively low cost, then in long-run equilibrium people in the North will work longer hours and earn higher wages (as well as higher incomes) than their counterparts in the South.
7. If tractors and labor are used to produce potatoes, and if the price of tractors is greater than the price of labor, it is possible for the government to lower the equilibrium price of potatoes by requiring firms to decrease the tractor-labor ratio they use.
8. The value of a tree farm can be calculated by multiplying the board feet of the lumber in the standing trees by the current price of lumber.
9. Several years ago, the City of Seneca sold the right to exercise a natural monopoly over the cable TV franchise to the highest bidder (Northland Cable). The economist working as a consultant for the City claimed that because the competition for the franchise was open to all potential bidders, the welfare cost of the monopoly was thereby eliminated. Do you agree or disagree with the City's economist? Explain.
10. On average, Clemson faculty members are football fans.
11. There are two checkout lanes at Zabar's supermarket. The clerk at Lane 1 is twice as efficient as the clerk at Lane 2. Therefore, the line in Lane 2 will be twice as long as the line in Lane 1.

1. Surveys of individuals tend to find low or no correlation between income and self-reported happiness. TFU: These findings suggest that it is incorrect to model consumers as utility maximizers upon whom budget constraints are binding.
2. Because traffic lights at intersections reduce drivers' choice sets, they must reduce drivers' utility.
3. If consumers have Cobb-Douglas preferences, all compensated demand curves are inelastic.
4. If negotiation is costless and rights are well-specified and enforced, then the allocation of resources will be identical, whatever the initial allocation of legal rights.
5. Constant returns to scale industries have perfectly elastic long run supply curves.
6. A price discriminating monopolist produces more output than a single price monopolist.

1. To maximize profits, a price discriminating monopolist selling in two markets will seek to equate marginal revenue in the two markets.
2. A rational consumer who expects the relative price of personal computers (of a given computing capability) to fall by 10% over the next year will not buy a PC now if the real rate of interest is less than 10%.
3. A monopoly will always produce goods of lower quality than would be supplied if those goods were produced by a perfectly competitive industry.
4. A monopolist will never be observed to operate in the inelastic range of demand.
5. In the United States, the demand for frozen turkeys can safely be presumed to be much higher close to Thanksgiving than it is during the rest of the year. It can also be presumed that the demand for fresh roses is much higher close to Valentine's Day than it is during the rest of the year. Casual empiricism suggests that the price of frozen turkeys does not exhibit a "spike" (i.e., sharp rise) at Thanksgiving while the price of fresh roses does exhibit a spike at Valentine's Day.
TFU: This evidence suggests that the consumers and producers of roses are short-sighted, compared to the consumers and producers of turkeys.
6. **TFU:** A two-factor, constant-returns-to-scale production function generates homothetic isoquants.

The Endangered Species Act (ESA) regulates (to the point of prohibiting) the development of land that is known to be a habitat for endangered species. This makes it profitable for landowners to purge their land of any such species prior to their discovery on the parcel of land to be developed. (This practice is sometimes known as “shoot, shovel, and shut up.”) Recently the journalist Gregg Easterbrook proposed a modification of the ESA that would preserve wildlife habitat without the aforementioned incentives of the current law. His proposal is that the federal government charge *all* developers (not simply those who have endangered species on their property) a \$1,000 per acre fee to be paid in conjunction with building permits. The proceeds of this fee would be used to purchase land best suited for wildlife habitats.

An environmental economist has commented on the Easterbrook proposal. Excerpts from his comments are reprinted below, with numbers added for purposes of this question:

[1] “What is good [about Easterbrook’s proposal]... is that it removes the incentive for an owner to get rid of listed species.”

[2] “What is bad is that Easterbrook does not recommend respect for property rights. Rather, he is offering a plan that would allow landowners to buy out of some land regulations. Any landowner, by paying \$1000 per acre, could win control of the land that he or she ‘owns.’”

[3] “The plan might be legitimate if it replaced taking from the few with a general tax on the many. But Easterbrook still proposes that all the cost be borne by landowners who develop their land and those who buy it....But why should those who want to build be required to carry a burden that all society should carry if all society truly benefits from protection of these species”

[4] “Furthermore, the proposal leaves in bureaucrats’ hands most of the decisions about protecting species (which species should have priority? Which populations? What level of protection?) A true free market solution would leave these decisions in the hands of individuals and voluntary associations...Instead of political fights, we...want private individuals and associations to protect habitat and species in the ways they know best. We want Nature Conservancy preserves, Audubon Society refuges, local land trusts, and voluntary groups that put up bluebird and purple martin nesting boxes. Let’s not turn them over to a federal bureaucracy.”

Evaluate, from the standpoint of economic efficiency, the statements of this environmental economist in each of the numbered passages above. Be explicit, thorough, and succinct.

1. Cap'n Dan's Cruises (CDC) is the only cruise line company to serve the small tropical islands of East and West in the Caribbean. For simplicity, you may wish to assume that CDC's costs depend only on the total number of passenger-trips CDC makes (where a "passenger-trip" means one passenger carried to one island).

- a. Write out the profit-maximizing problem faced by CDC and solve for the optimum. Sketch a picture of what you have just done, labeling any key features.
- b. How will CDC change its prices if the island of West begins to charge a disembarkment tax of \$ k per person visiting the island? In particular, how will the price of cruises to the island of *East* change?
- c. What would happen to the price of cruises to West if the island East were blown away by a hurricane?
- d. How would your answers to (b) and (c) change if consumers regarded trips to East and West as perfect substitutes?

2. Assume the following demand functions characterize two markets served by a monopolist. Further assume that these demand curves reflect the ability of the monopolist to separate the markets and thereby price differently in each market.

$$q_1 = 2 - 2P_1 + P_2$$

$$q_2 = 1 + P_1 - P_2$$

Let the cost of production be: $C = q^2 = (q_1 + q_2)^2$.

Answer the following questions. (Note: Most of the credit will be given for correctly specifying and analyzing the economic problem in each question; trivial errors in arithmetic will be (almost) free.)

- A. What is the profit maximization price and quantity in each market?
- B. How will the profit-maximizing values change if a per-unit tax of \$0.10 is levied in market one? Most importantly, what is the change in price and quantity in market two?
- C. What tax rate imposed on market one will maximize tax revenue?

Hint, applicable to all three questions: Remember that you can model the problem in price or quantity space, and this is true even for cost.

1. Consider the Cobb-Douglas production function $q = x^a y^b$.
 - a) What values of the input parameters satisfy the conditions for profit maximization?
 - b) What is the implication for market equilibrium when $a+b=1$?
 - c) Discuss the nature of industry supply.

2. For the utility function $U = x^y$:
 1. Check for convexity.
 2. Solve for the optimal amount of x and y .
 3. Find the value of the partial of x^* w.r.t. P_x by differentiating the explicit function $x^*(\cdot)$.
 4. Find the value of the same partial by differentiating the system of first order conditions and solving by Cramer's Rule.
 5. Are (c) and (d) identical?
 6. Is the optimal consumption of y a function of P_x ?
 7. What happens if the utility function $U = \log(x) + y$ is substituted? Explain.

3. If $f(x_1, \dots, x_n)$ is homogeneous of degree r in the first k variables only, that is,

$$f(tx_1, \dots, tx_k, x_{k+1}, \dots, x_n) = t^r f(\cdot),$$
 then is the sum of $f_i(\cdot)x_i$ over $i=1, k$ equal to $rf(\cdot)$?

4. Let $f(x_1, x_2) = A(ax_1^{-r} + (1-a)x_2^{-r})^{-1/r}$. Show that $f(\cdot)$ is homogeneous of degree 1.

5. Demonstrate that if average cost is U-shaped, marginal cost cuts it at the minimum.

Suppose you are scheduled to take an exam with two parts; the maximum available number of points on each part are designated by X_m and Y_m respectively. Although $X_m = Y_m$, you know that the committee grading the exam does not weight the points from the exams equally when it assigns a score to each paper. In particular, scores are assigned as follows:

$$S = \beta \ln X + Y$$

where X and Y are the actual points you receive on each part.

Your abilities in taking the exam are given by the following

$$X = \alpha_x t_x$$

and

$$Y = \alpha_y t_y$$

where t_x and t_y are the number of minutes you spend on each question, and you are limited to spending no more than T minutes on the exam as a whole.

A. Draw a picture in the (X, Y) space of the opportunity set you face, being sure to label all relevant points (slopes, intercepts, etc.). Be careful; getting this correct is important in everything that follows. Please put X on the horizontal axis.

B. What is the “price” of a point on each part of the exam?

C. Assuming that your objective is to maximize your score, as calculated above, what is your optimal allocation of time between the two questions? Show all of your work explicitly.

D. Suppose that you are given an extra K minutes to use on the exam. How will you allocate it? Be precise and be sure to explain how the specifics of your decision depend on the optimum for which you solved in part C.

E. Will you ever choose to get a perfect score on either part of the exam? Explain.

F. Suppose you are at an optimum at which you are not intending to obtain a perfect score on either part. If α_x changes, how will you change your allocation of time between the two parts of the exam? Be precise and show your work explicitly.

In an isolated mountain village, the only crop is corn. Good harvests alternate with bad harvests. This year the harvest will be 1,000 bushels. Next year it will be 150 bushels. There is no trade with the outside world. Corn can be stored from one year to the next, but rats will eat 25 percent of what is stored in a year.

Assume only two periods are relevant. The villagers have Cobb-Douglas utility functions of the form $U(c_1, c_2) = c_1 c_2$ where c_1 is current (this year) consumption and c_2 is consumption next year.

- a. What is the expression for the opportunity set of consumption combinations now and later?
- b. How much corn will the villagers consume this year and next year?
- c. How much will the rats eat?

Now assume that a road is built to the village so that trade with the outside world is possible. Villagers can now buy and sell corn at the world price, which is \$1 per bushel. They can also access the world banking system and borrow or lend at an interest rate of 10 percent.

- d. What is the expression for the opportunity set of consumption combinations with trade?
- e. How much corn will the villagers consume now in each period?
- f. How much (if anything) would the villagers conceivably be willing to contribute to finance the construction of the road? Explain.

Consider a couple (e.g., husband and wife) who will live for two periods, in a world in which the interest rate is zero.

In the first period, the couple has a fixed income of Y and chooses current consumption, C . Their accumulated assets (labeled A) at the end of the period will be the difference between their income and their current consumption.

In the second period, the couple will have no income. However, they will use their accumulated assets to pay for their consumption in the second period (called retirement consumption, or R) and also to pay for their child's education. The amount that they will spend on education will be E (for educational outlays).

Subject to the above restrictions, the couple chooses their first-period consumption C , their second-period retirement consumption, R , and their educational outlays, E , to maximize their utility U , where $U = U(C, R, E)$.

- a. Give the condition(s) that must hold for utility maximization. Give an economic interpretation of the mathematical result. (HINT: For the purposes of answering the questions that follow, substitute for C and R in writing the utility function, so that the variables A and E appear *explicitly*.)

Now make the following additional assumptions:

Scholarships (S) for education are available. Now the amount that the couple spends on education will be $E + S$. The college allocates the scholarship funds to each family based on the following formula:

$$S = \alpha(E - \theta A), \text{ with } 0 < S < E$$

Where

- α is a constant ($0 < \alpha < 1$), and
 θ is a constant ($0 < \theta < 1$).

- b. Give the condition(s) that must hold for utility maximization. (Again, use the hint given above.) Explain the impact of the availability of scholarships on the couple's consumption and savings.
- c. Give economic interpretations of α and θ .
- d. How does the marginal rate of substitution (MRS) between C and R change as α changes? Give an economic explanation of this result explaining how and why consumption patterns change as α changes.
- e. How does the MRS between C and E change as θ changes? What about the MRS between C and R as θ changes? Give an economic explanation of these results, indicating how the allocation of funds toward current consumption and toward savings changes as θ changes and explaining why.

1. In societies where the cost of bearing children is lower (e.g., the medical risk to mothers is lower), women have fewer children. Also, in economies with higher per capita incomes, people have fewer children. Hence, children are a Giffen good.
2. The new tax law (recently signed by President Clinton) gives individuals a \$1500 tax credit for college expenses. Two individuals, Tom and Ben, will soon begin college and are analyzing the benefits of this tax credit to them. Each student will be paying for his education himself (i.e., receiving no scholarships, gifts, etc.).

Tom indicates that he would have preferred a check from the U.S. Government for \$1500 rather than the tax credit. He explains that the cost to the Government would have been the same (i.e., \$1500 for him). Therefore, he thinks this is another example of how the Government tries to help its citizens, yet blunders in its delivery of the help.

Ben disagrees with Tom. Ben doesn't care whether the Government gives him \$1500 in cash or the \$1500 as a tax credit. He gets \$1500 in each case. Ben says if one actually gets the tax credit at the same time that he would have gotten the cash, then everyone should be indifferent between the two choices. Ben says that Tom is just complaining without justification.

Explain how each student's opinion either is, or is not, consistent with economic theory.

3. Every good must have at least one substitute.
4. If telecommunications is a gross complement to automobile transportation, but automobile transportation is a gross substitute for telecommunications, what do we know about the relative income elasticities of automobile transportation and telecommunications? Explain.
5. The demand for fresh fish products in China has been estimated to be very price inelastic and also highly income elastic. Are such estimates consistent with the theory of consumer behavior?

In-state students at Clemson University pay $P = \$125$ per credit hour for the classes they take, up to 12 credit hours per semester, a level that makes them “full-time students.” Additional credit hours beyond 12 per semester can be taken by full time students at no additional charge, but no more than 21 credit hours per semester can be taken by anyone. (For simplicity, assume throughout that credit-hours are continuously divisible, just as we normally assume for goods.)

- A. For a world in which there are just two goods (education and “all other goods”), write out and draw a picture of the budget constraint facing in-state Clemson students. Please put education, measured in credit hours, along the horizontal axis.
- B. If a student were observed to take 15 credit hours in a semester, what can you infer about that student’s marginal rate of substitution between other goods and education?
- C. If students consider education to be a good over all ranges of feasible consumption, what can you predict about the number(s) of credit hours that students will be observed to take each semester?

Recently, the state of South Carolina introduced the LIFE Scholarship, which pays in-state students \$1000 per semester, provided that they enroll for at least 12 credit hours for that semester. Assume for simplicity that the taxes used to pay for these scholarships are *not* levied on students.

- D. Show both algebraically and graphically how the introduction of the LIFE scholarships affects the in-state student’s budget constraint.
- E. Once the scholarship is in place, will *any* students go to school part-time (i.e., less than “full-time” as defined above)? Explain.
- F. Consider a person originally (before the scholarship program) enrolled for 8 credit hours. What will be this person’s response to the program? Be precise.
- G. Are there any students whose educational consumption will be *unaffected* by the introduction of the LIFE scholarships?

Suppose the LIFE scholarships were worth \$1500 per semester, but were otherwise the same as noted above.

- H. Would any students go to school part-time? Explain.

Shown below are some estimates of equations that are claimed to be demand curves. Which of these alleged demand curves satisfy the basic laws of demand? Which do not? Explain.

(In answering, assume that the estimated standard errors are very low relative to the estimated values of the coefficients.)

NOTATION: $\ln Q$ is natural log of the quantity demanded

$\ln P$ is the natural log of the price (own- or cross-price, as appropriate)

$\ln M$ is the natural log of money income

a. The demand curve for good 1 is estimated:

$$\ln Q_1 = 1.1 - 1.1 \ln P_1 - 1.1 \ln P_2 + 1.1 \ln M$$

b. In a world where consumers spend 20% of their income on good 1:

$$\ln Q_1 = 1.1 - 0.4 \ln P_1 - 2.6 \ln P_2 + 3.0 \ln M$$

c. In a two good world, this system of demand curves is estimated:

$$\ln Q_1 = 3.2 - 1.7 \ln P_1 + 1.3 \ln P_2 + 0.4 \ln M$$

$$\ln Q_2 = 1.4 + 1.2 \ln P_1 - 0.9 \ln P_2 + 0.3 \ln M$$

d. Based on Chinese expenditure data aggregated to the categories non-food (good 1) and food (good 2) this system of demand curves is estimated, with expenditures divided equally between the two categories:

$$\ln Q_1 = -.77 - 1.015 \ln P_1 - .015 \ln P_2 + 1.03 \ln M$$

$$\ln Q_2 = -.62 + .015 \ln P_1 - .985 \ln P_2 + .97 \ln M$$

e. The demand curve for good 1 is estimated:

$$\ln Q_1 = 2.2 - 0.7 \ln P_1 + 0.3 \ln P_2 + 0.4 \ln M$$

Consider the same person in two different years. In the first year he makes \$90,000 in wage income and \$10,000 in investment income. In the second year earns \$50,000 in wage income and \$50,000 in investment income. In both years, his wage rate (per time period worked) is known to be the same.

- a. Construct the budget constraint facing this person in each year, both algebraically and graphically.
- b. Graphically demonstrate his optimum combination of leisure and the non-leisure good in each of the two years. Be precise: much of what follows depends on your answer here.
- c. What is this individual's income elasticity of demand for the non-leisure good over the observed range?
- d. Suppose for computational simplicity that each year contains a total of exactly 8000 hours. Also suppose that this person's hourly wage rate is \$50 per hour.
 - (i) What share of his income is this person devoting to each of the two goods (leisure and non-leisure) in each of the two years?
 - (ii) What is this person's income elasticity of demand for leisure over the observed range? (Hint: Your answer to part (c) contains a key piece of information.)
- e. Consider now this person's price elasticity of demand for the non-leisure good. What can you say about the relative magnitudes of his compensated and uncompensated own-price demand elasticities for the non-leisure good in each of the two years? Explain, using whatever algebraic or diagrammatic aids you find appropriate.
- f. Consider now this person's price elasticity of demand for the leisure good. What can you say about the relative magnitudes of his compensated and uncompensated own-price demand elasticities for the leisure good in each of the two years? Explain, using whatever algebraic or diagrammatic aids you find appropriate.
- g. What, if anything, can you conclude about his elasticity of supply of labor in one year compared to the other? Explain.

1. Assume preferences between consumption, C , and leisure, L , are given by

$$U = \theta \ln C + \alpha L$$

Assume that each individual is endowed with money income of A and is also endowed with exactly one unit of leisure time. It is possible for an individual to sell some or all of his or her time (to "firms," which use it to produce the consumption good), thus enabling the individual to consume more than A dollars worth of the consumption good and less than one unit of L . It is *not* possible for an individual to consume more than their endowed one unit of leisure. "Work" (i.e., leisure that is sold) is paid w per unit time, and the price of consumption is p .

- Sketch a picture of the individual's maximization problem, labeling key points on the individual's budget constraint. Please be sure to sketch the constraint specified in *this* problem, and not in some other problem.
- Write out the individual's maximization problem.
- Solve for the optimal choice of consumption and leisure. (Query: Do the first order conditions summarize *all* plausible optima?)
- Verify that the weighted sum of income elasticities is 1. (Query: Are the income elasticities constants, or do they depend on the optimum chosen by the individual?)
- Use your results in part (c.) to solve for the expenditure function and for the individual's compensated demand curves for consumption and leisure.

2. Food and clothing are the only two goods that Jack consumes. Jack always spends 25 percent of his income on food. The income elasticity of demand for food is 1.0 and the own-price elasticity is -1.0. Therefore the cross-elasticity of demand for food is zero.

3. Consider the problem of consumer behavior involving work and leisure. Let the utility function be expressed as $U = U(M, L)$, where M is income, L is leisure. The relationship between M and L is $M = E + (24 - L)W$, where E is an initial endowment and W is the wage rate.

- Demonstrate that the wage rate is the price of leisure.
- Evaluate the Slutsky condition; what constraint on consumer behavior is implied?
- Some business school graduates go on for an MBA, some do not. Assume that they are all of equal ability and tastes for work, and that the tuition cost of the MBA is paid for by each student. What predictions can we make about the behavior of those who do not go on for an MBA compared to those who do?

1. Work out the system of demand curves for the utility function $(xy + y^2)$. Show that all of the conditions of the theory of consumer behavior are satisfied.
2. It is impossible for a demand curve to have a constant elasticity throughout its entire price range.
3. If the State of South Carolina replaces the property tax on cars with a higher gasoline tax, the result will be less fuel-efficient cars on the roads of South Carolina.
4. Even though it seems odd that, in China, fish is a complement to meat (the cross price elasticity of the consumption of fish with respect to the price of meat is $-.11$) while meat is a substitute for fish (the cross price elasticity of meat with respect to the price of fish is $.01$), these facts are consistent with the income elasticities which are 1.34 for fish and 2.53 for meat.
5. If a good is income elastic, it is price elastic.
6. If Professor Ferc claims that the demand for electricity is given by
$$\ln Q_e = -.62 \ln P_e + .48 \ln P_g + .50 \ln I$$
(where e and g refer to electricity and natural gas, P is price, Q is quantity, and I is income), the Professor should be fired.
7. Mark consumes only two goods, beer and chicken wings. In 1995 he devoted 40% of his expenditures to beer and 60% to chicken wings. In 1996 the price of beer rose by 25%, Mark's income rose by 10%, and he continued to allocate his expenditures in the same proportions. In 1997 the prices of beer and wings were unchanged, Mark's income fell by 10%, and he *still* spent the same proportion of his income on beer. Based on this information, we can conclude that the elasticity of Mark's demand for chicken wings with respect to the price of beer is zero in the neighborhood of the observed price variations.
8. Because of income effects, the equivalent variation measure of welfare change is larger than the compensating variation measure.

Estimating consumer surplus:

A. Assume that the Chinese demand curves for grain and fish (from Lecture 9) apply to the United States. Per capita income in the U.S. is around \$31,000.

1. The fisheries regulatory authority has imposed a ban on long-line fishing that will allegedly increase the price of fish to U.S. consumers by 20 percent. How much will this restriction harm the average consumer?+

1a. What if the American demand for fish is similar to the Chinese demand for meat?

2. How much would U.S. consumers be willing to pay to reduce that price of bread and other grain products by 10 percent?

B. The demand for state parks in the mountains of South Carolina has been estimated to be:

$$\ln q = -1.5 - .002P + .03M$$

where P is price and M is income. This is the demand estimated for people who visit these parks. The price of a trip is \$500 which includes travel time and other expenditures. Assume that the average visitor has an income of \$31,000. (M is measured in thousands.) These people are also estimated to spend approximately 5 percent of their income on this form of recreation. Assume that the average wage rate for these people is \$16. How much would it be worth to these people to build a road that would save 2 hours of travel time per visit.

1. Kurt has an obsessive personality. *Ceteris paribus*, the more beer he drinks, the higher is the marginal utility of beer to him. In addition, the more potato chips he eats, *ceteris paribus*, the higher is the marginal utility of potato chips to him.

TFU: If Kurt were in a bar that served only beer and potato chips, he would either drink beer or eat potato chips (depending on their relative prices) but he would not consume both.

2. Suppose that the nation of Santa Pellagra is populated entirely by households with identical preferences and incomes for whom rice is a Giffen good. Assume further that Santa Pellagra is a small, open economy that produces no rice domestically.

TFU: If Santa Pellagra imposed an import duty on rice, and if the revenue from that tariff were distributed randomly among all households in the nation, then the quantity of rice consumed in Santa Pellagra will decline.

3. On Monday, when prices are $(p_1, p_2) = (10, 20)$, Ralph purchases a bundle $(x_1, x_2) = (9, 3)$, exhausting his income. On Tuesday, when prices are $(p_1, p_2) = (5, 25)$, Ralph purchases $(x_1, x_2) = (1, 6)$.

TFU: Between Monday's purchases and Tuesday's purchases, Ralph's preferences must have changed.

4. TFU: The U.S. Consumer Price Index overstates the true inflation rate. (b) TFU: The Laspeyres price index is biased downward as a measure of changes in the cost of living.

Let

$$E = \frac{\sum_i p_i^1 x_i^1}{\sum_i p_i^0 x_i^0} \quad L = \frac{\sum_i p_i^1 x_i^0}{\sum_i p_i^0 x_i^0} \quad P = \frac{\sum_i p_i^1 x_i^1}{\sum_i p_i^0 x_i^1}$$

Under the following conditions, what if anything can be said about the change in the consumer's real income between periods 0 and 1:

- $E > \max\{P, L\}$
- $E < \min\{P, L\}$
- $L > E > P$
- $P > E > L$

Answer for each condition separately, being sure to demonstrate the basis for your conclusion.

Suppose you live in a world called New Hampshire. You consume two goods, housing (H) and all other goods (A). Assume that you supply labor completely inelastically, so that your budget constraint is $rH + A = M$, where r is the unit price of housing, M is your earned income, and the price of all other goods is normalized to unity.

Transaction costs in New Hampshire are zero, and housing is a perfectly divisible good. Assume that your tastes for housing and all other goods are constant now and forever more, implying that you have purchased the house in which you reside with only the thought of consuming the flow of housing services in mind; thus houses are not purchased to serve as a store of value, etc.

While out for a walk one day, you discover a bottle in which a genie resides. He offers to grant you one wish, but says you must choose between three options:

- (1) He will go back into the bottle and leave you alone to live as you were living before you found the bottle; or
- (2) He will cause an earthquake that will destroy half of the houses in New Hampshire; your house will be one of the houses that is left completely undamaged; or
- (3) He will create a gold discovery in Alaska that will induce half of the residents of New Hampshire to move away; however, you will not be allowed to leave to participate in the gold rush.

Which wish do you want the genie to grant? Explain your answer carefully and completely.

1. If every firm in a competitive industry uses a constant-returns-to-scale production technique, then the long-run supply curve of that industry is perfectly elastic.
2. The marginal cost curve of any firm is that firm's supply curve.
3. If plant size is optimal, short run marginal cost must equal long run marginal cost.
4. Employers in seasonal industries, such as housing construction in cold climates, must pay their workers a higher hourly wage than they would if they were in year-round operation.
5. Patents grant a legal monopoly over a new product or process for a period of 20 years. Such an arrangement imposes an efficiency loss (relative to unregulated competition) due to underproduction of the patented item.
6. If there were a readily identifiable genetic marker for all diseases, there would be no market for medical insurance.
7. If the crude oil industry is perfectly competitive, then (neglecting the costs of drilling) the present value of an oil deposit of volume B (in barrels) is equal to $P_t B$, where P_t represents the current price per barrel.

1. A graduate student in applied economics claims to have estimated a production function for kumquats that looks like this:

$$\ln q = 14.6 + 0.618 \ln K + 0.782 \ln L$$

where q is the output of kumquats, K is capital, and L is labor, and "ln" means natural logarithm.

- a. According to these estimates, will the factors of production in this industry be paid the value of their marginal product? Convince us.
 - b. Is the kumquat industry competitive?
2. Bees perform two economically relevant activities: They pollinate flowering plants and trees (including, for example, fruit trees); and they produce honey that can be consumed by humans. Bee keeping is an unusual industry in the following regard. Sometimes bee keepers are paid to place their hives in a field and sometimes the bee keepers must pay for this privilege. Several questions are presented by this market structure
- a. What causes the terms of trade to reverse in this manner? Explain.
 - b. What determines how many hives there will be in the beekeeping industry? Explain.
 - c. If imports of honey are restricted what will happen to the frequency with which bee keepers must pay to locate their hives, as opposed to being paid to locate them? Explain.

An inventor asks your advice. She has just developed a new kind of patio furniture. The furniture has unique characteristics that are patented. As a consequence, the market demand curve for the furniture is downward sloping and can be characterized as $q=20-p$ based on analysis done by a competent advertising agency. The unit cost of manufacturing the furniture is constant at \$1 per unit. The marginal cost of selling the furniture is given by $MC=q$.

The inventor wants to know whether it would be better to start her own retail store or simply sell the furniture through the existing retail establishment. If she starts her own store, there is an overhead cost of \$20 in addition to the selling cost. If she sells through the existing outlet, there is no overhead but the same marginal selling costs are incurred by the existing retailer.

Please respond to the following specific questions in sufficient detail to be convincing:

a. If she starts her own store, at what price should she sell the furniture? How much will she sell? What will be the costs of production and of selling? What are her profits?

b. If she sells the furniture at wholesale to the existing retail establishment at a flat price per unit, is it possible to make as much profit as will be made by owning the retail establishment?

(Hint: Recognize that you must account for the independent profit maximizing behavior of the retailer.)

c. She could sell the furniture on a franchise basis. One way to do this is to make the retailer pay for the furniture at manufacturing cost and then charge a royalty that is a percentage share of net revenues, where net revenues are revenues less the cost of the furniture and less marketing costs incurred by the retailers. Is there a royalty rate that will generate more profits for our inventor compared to opening her own stores?

d. What are the possible contracting problems that might develop in the franchise case? What are the contracting problems of opening a company store? Explain.

A firm knows that it will sell N units of a product during a period at a uniform rate. (For example, if the firm knows that it will sell 100 units in 100 days, then it will sell 1 unit each day.) Assume that the firm places orders of equal quantities. That is, the firm orders n units of the product each time it orders. Also assume that the entire order arrives and is available for sale instantaneously. Thus, inventory is at its maximum when the order arrives. The inventory decreases uniformly until it becomes zero. Then the next order arrives. Thus, the firm always has enough units to satisfy its customers.

The firm incurs a fixed cost of D dollars whenever the firm places an order of any quantity. The firm also incurs storage costs of S dollars for each unit of the product that it holds in inventory. (These storage costs include interest costs as well as the physical costs of storage.) Given that the maximum inventory is n units and the inventory decreases uniformly, the firm holds $n/2$ units of inventory on average during the period.

- (i) Give an economic explanation (in words) of how a profit-maximizing firm decides how many units it will order and how many times it will order each period.
- (ii) Use mathematics to show how a profit-maximizing firm will determine the optimal number of units it will order and how many times it will order each period.
- (iii) Use mathematics to determine how the optimal number of units ordered changes as the per unit storage cost changes. Give an economic explanation of the mathematical result. Specifically, does the optimal number ordered increase, decrease, or remain constant as storage cost increases? Explain.
- (iv) Now assume that the order arrives continuously instead of instantaneously. Ignore all costs other than the ones described above. Would the optimal number of units ordered increase, decrease, or stay the same? Explain.

Suppose that the operators of taxicabs must have a government-issued license to operate. If they have a license, they may supply as many taxicab services as they care to. If they attempt to operate *without* a license, they are immediately shot and their bodies are fed to the crabs. Licenses are "freely transferable" (i.e., may be purchased and sold) once they have been issued by the government.

The *market* demand for taxicab services ("rides") is as follows:

$$P = 100 - Q$$

where P is the price per ride and Q is the market quantity of rides consumed.

The *marginal* cost curve of each and every current and prospective taxicab operator is as follows:

$$MC_i = 10 + q_i$$

where q_i is the number of rides produced by the i^{th} taxicab operator, and MC_i is the *marginal* cost of operating at that rate of output. All costs (except the cost of a license--see below) are variable; that is, they depend on output in exactly the manner shown above.

Initially there are fifty (50) taxicab licenses.

- a. What will be the rental rate or lease price of a license per period?
- b. Suppose there are complaints among prospective taxicab operators that taxicab licenses are "too expensive" for them to afford. Why are these complaints stupid?
- c. Despite your eloquent answer to the previous question, the government decides to issue more licenses. Specifically, it decides that \$1 per license is a "fair and just" rental rate or lease price for licenses. How many licenses must the government issue to achieve this price?
- d. Will increasing the number of licenses make prospective taxicab operators better off? What about existing taxicab operators? What about taxicab riders? Explain.
- e. How, if at all, do your answers to part (e) depend on whether the government *sells* new licenses or simply *gives* them away? Explain, being sure to distinguish among the various affected groups.

Assume that sailboat construction is characterized by the following production function:

$$q = K^{0.3}L^{0.1}F^{0.6}$$

where q is output, K is capital, L is labor, and F is fiberglass. Sailboat construction is a competitive industry. The latest available data indicate that industry revenues last year were \$10 billion.

- a. How much did the industry spend on labor last year? Convince us.
- b. If fiberglass is used only to make sailboats, what were total revenues of the fiberglass industry last year? Convince us.
- c. Does your answer to part (b) depend on whether or not the fiberglass industry is competitive or monopoly? Explain.
- d. What is the output-constant elasticity of demand for each factor of production?

It is well known that the demand for sailboats is unit elastic.

- e. Based on this knowledge of the demand elasticity for sailboats, what must be the elasticity of demand for labor and capital in this industry? Convince us.
- f. Are labor and capital substitutes or complements? How do you know?

1. The wife of one of your examiners has been offered a new job. Part of the fringe benefit package is that her new company will pay for 50% of the cost of all of her restaurant meals--any time, any place.

- (a) How should she value this fringe benefit when comparing the new job with the old job?
- (b) Is it possible that the value she places on this fringe benefit could equal or exceed the cost of the fringe benefit to her new company? Explain.

Suppose you pass this exam and are offered a job as a result.

- (c) How much would a company car--just one, but at a zero price--be worth to you if it were part of the offered employment package?
- (d) Is it possible that the value you place on this fringe benefit could equal or exceed the cost of the fringe benefit to your new company? Explain.

Do your answers to parts (b) and (d) suggest how a cost-minimizing employer might structure the types of fringe benefits offered employees? Explain briefly.

2. Firm A signed a contract to deliver Q units to Firm B by the end of the year at a fixed per unit price of P_1 . The contract will occupy Firm A's entire production capacity during the period (i.e., $Q =$ full capacity output). The cost function of Firm A is

$$C = F + \alpha q \quad \text{for } q \leq Q$$

where $F =$ fixed costs and α is a constant. In addition, Firm A must pay a tax of T dollars per year to the local government.

After signing the contract, the price of a major input increases significantly, causing Firm A's marginal cost to increase to β . Firm A will lose money by fulfilling its contract because $\beta > P_1$. Therefore, Firm A wonders whether it should fulfill the contract that it signed.

If Firm A does not fulfill the contract that it signed, then Firm A will have to reimburse Firm B for any excess amount that Firm B pays for the product. Firm A estimates that Firm B will have to pay P_2 per unit (where $P_2 > P_1$) and thus it (Firm A) will have to pay $P_2 - P_1$ for each unit not delivered.

Firm A is then approached by Firm C, which wants Firm A to deliver Q units to it by the end of the year at a fixed per unit price of P_3 , where $P_2 > P_3 > \beta$. Firm A has only enough production capacity to fulfill one contract (i.e., either the contract with Firm B or the one with Firm C).

- a. Is it possible to determine which contract Firm A should fulfill, if its objective is to maximize profits? Explain.
- b. Under what circumstances, if any, should the firm simply shut down? *Be specific.* Explain.

1. Suppose South Carolina wants to ensure that legal services are provided to the poor. Analyze the effects of each of the following options on the labor supply of lawyers.

- a. All practicing lawyers in South Carolina would be required to devote 10% of their work time to the poor, free of charge.
- b. All practicing lawyers in South Carolina would be required to provide 200 hours of work each year to the poor, free of charge.
- c. All practicing lawyers in South Carolina who earn more than \$50,000 per year would have to donate \$5,000 to a fund that would be used to provide legal services to the poor.

2. Curt Flood recently died. Flood was a centerfielder for the Saint Louis Cardinals baseball team in the 1960s. He spent the last years of his career fighting the 'reserve clause' in major league baseball in court. The reserve clause effectively bound a player to a team for life, because a player could not change teams without permission. Flood lost his legal battle, but in the wake of the struggle, free-agency was introduced to baseball, and the reserve clause was essentially eliminated. As a consequence of this change, Professor Gerald Scully reports, over the past 20 years major league player salaries have risen to nearly 60% of total receipts, up from only about 20% before.

- a. Analyze the impact of the elimination of the reserve clause, and thus the introduction of free agency, on the prices of tickets to major league baseball games.
- b. Analyze how the introduction of player free agency affected player movement between teams.
- c. Describe how you would subject your theory on player movement before and after free agency to empirical scrutiny. *Be specific.*

3. There is a common practice in retail food stores to charge wholesalers for shelf space. (Thus, for example, Coca-Cola must pay Winn-Dixie a rental fee for each linear foot of shelf space occupied by its products in each Winn-Dixie store.) These fees vary considerably across products and brands of products.

Suggest an economic explanation for these fees and propose a test of your hypothesis. To receive any credit for your proposed test, it must be based on observable *behavior*, and not on whatever people might claim to be the (alleged) reasons for their actions.

1. Several years ago the City of Clemson considered the possibility of imposing an "impact fee" on all new residential construction within the City. The fee would be paid by the builder whenever a new residence was constructed. Two possibilities were explored: (i) a fixed amount per residence, independent of the size or value of the new home; and (ii) a fee that was a fixed percentage of the value of the new construction.

- a. Illustrate graphically the impact of each of these options on the budget constraint of a representative individual.
- b. For a given amount of revenue collected by the City, which type of fee would discourage more new construction within the City? Convince us.

In the end, the City designed to implement a program that comprises two elements: The City (i) imposes a fixed impact fee on each new unit of residential construction, with the size of the fee independent of the size or value of the new homes, and (ii) spends the proceeds of the impact fees collected to support recreation and public safety (for example, police and fire).

Analyze the effect of this program on the following:

- c. The price of vacant residential lots within the City compared to vacant residential lots outside the City.
- d. The price of *new* houses inside the City compared to the price of *existing* houses inside the City.
- e. The relative prices of houses of different sizes within the City.
- f. The price of new houses inside the City compared to similar new houses located outside the City.

2. Assume that all health insurance is provided by private health insurance companies. Initially, these companies are *not* legally required to provide insurance coverage for pre-existing illnesses, and in fact they do not provide such coverage. (A pre-existing illness is one that the policy holder had at the time the insurance policy initially was issued.)

Now suppose a law is passed requiring health insurance companies to provide coverage to policy holders for pre-existing illnesses.

- a. What will be the effect of this law on the following?
 - i. the price of health insurance coverage
 - ii. the number and age distribution of people who buy health insurance
 - iii. the price of medical services
 - iv. the price of common stock of health insurance companies.

Explain your answers briefly but carefully.

- b. Under what circumstances, if any, would private health insurance companies willingly provide coverage for pre-existing illnesses, in the absence of some government requirement? Explain.

A large number of ranchers in eastern Montana raise cattle. The only source of water for the cattle is a large but shallow lake. This lake is centrally located so that each ranch has direct access to it. Hence, cattle owned by any given rancher can drink from the lake without passing across land owned by another rancher. All of the land on these ranches (and only this land) drains into the lake. Manure runoff from the cattle leeches into the lake and this contamination sometimes kills some cattle. The hazard to the cattle from the runoff depends on the total number of cattle (and thus manure) on all of the ranches. Not surprisingly, the death rate among the cattle affects the number of cattle that the ranchers are willing to graze.

Over the past several years, the price of cattle has been stable, as have the prices of the other inputs used to raise cattle. At the same time, however, the water level of the lake has fluctuated for exogenous reasons. This has caused fluctuations in the death rate, which has enabled you to deduce the following demand function for cattle on the part of the ranchers:

$$H = 20,000 - 20,000p$$

where H is the number of head grazed on all ranches, a and b are estimated from the data, and p is the proportion of cattle that die. You also have determined that the expected death rate is given by the following:

$$p = 0.0001H$$

- What is the equilibrium number of cattle if individual ranchers are free to determine how many cattle each will graze?
- Suppose the ranchers come to appreciate the cost of freedom and decide to form a Cattleman's Association. The sole function of this association is to impose and collect fees from all of its members. Fees payable by any member are based strictly on the number of head he grazes. If the price of cattle was \$600 per head during the sample period, what is the efficient fee? (Assume that proceeds of the fees are disposed of in a non-distorting manner.)
- What is the dollar value of the welfare gain from charging the fee, compared to the situation in which no fee is charged and the ranchers are free to graze as much as they like? (If this is computationally too tedious, set it up or draw a picture and move on to (d) and (e).)
- Under what conditions would you expect the ranchers to join together to solve the problem as you have solved it in (b)? Explain, briefly.
- Suppose the conditions you specified in (d) were *not* satisfied, and that government action were deemed necessary to solve the problem. At what level—county, state, national, or perhaps international—should the government action take place? Explain.

1. Suppose the Octopus Corp. has a monopoly on light bulbs. Its engineers discover a way to double the life span of the company's light bulbs, without any additional costs, i.e., the production costs of the new bulbs are the same as those of the old bulbs.
 - a. Under what conditions, if any, will Octopus suppress the invention, i.e., choose not to produce *any* of the *new* bulbs? Convince us.
 - b. Under what conditions, if any, will Octopus choose to produce *only* the *new* bulbs? Convince us.
 - c. If the new bulbs were more costly to produce than the old bulbs, how, if at all, would your answers to (a) and (b) change?

2. Consider two different plans to raise state tax collections. Both plans will tax retail business establishments in the state. (You can assume a competitive industry with a large number of homogeneous firms.) One plan imposes a unit sales fee for each unit quantity of output sold, a tax on output. The other plan imposes an annual fixed license fee for the right to operate in the state, a tax on the facility. *Both plans are designed to raise exactly the same amount of total tax revenues.*
 - a. In the long and short run, which plan will raise price more?
 - b. In the long and short run, which plan will have the greater impact on the number of firms in the industry?
 - c. Which plan is more welfare efficient, that is, it has the least dead-weight loss?

1. Medicare is a U.S. government program that subsidizes the health care of persons aged 65 or older (“senior citizens”) in this country. At least one presidential candidate has argued that a “drug benefit” be added to Medicare. One specific proposal is that the government should pay for half of an older person’s expenditures on prescription drugs.

A. Show how such a program would affect the representative senior citizen’s budget constraint. (Be explicit regarding your assumption as to who is paying the taxes needed to finance the program.)

B. One version of the drug plan would “cap” (limit) the government’s annual spending per beneficiary. Suppose a cap of \$2000 per year were included in the program. Compared to the program *without* the cap, how would the cap affect the behavior of various people? Is a program with a cap different from a cash grant to seniors to spend on anything they want to purchase? Explain, briefly.

C. Suppose the program is implemented *without* the cap; thus, senior citizens would get fifty cents from the government every time they spent a dollar on prescription drugs, no matter how much they bought. Also suppose that, because of existing patent protections, in the short run all existing drugs are each produced by monopolists. (For your convenience, you may also (but do not have to) assume that marginal manufacturing costs for existing drugs are effectively zero.) What will be the impact of the program on the price and rate of production of drugs in this short run, i.e., given the drugs already in existence? Be precise . . . very precise. By how much do senior citizens benefit? Be precise.

D. Again, assess the program without the cap, but now look at the long run effects. Specifically, assume that in the long run, there is competition for innovation in new drugs. What will be the impact of the program on the price and rate of innovation of new drugs in the long run? Be precise. By how much do senior citizens benefit? Be precise.

2. In the early days of personal computers, many software vendors attempted to copy protect their products. Most of these attempts failed for a number of technical reasons. Now that approach as resurfaced with digital music. Answer the following questions:

- A. Suppose copy protection for digital music turns out to be a failure. What will happen to the quantity and price of digitally recorded music as a result of this failure? Be careful—very careful—to specify precisely (i) what “quantity” you are referring to and (ii) the exact item whose price you are talking about.
- B. Will copy protection for digital music turn out to be a failure? That is, what are the relevant economic issues that will determine success or failure of copy protection for music?

1. In Walhalla, SC there are two kinds of workers. The first kind has a (constant) marginal product of \$15 per hour and the second has a (constant) marginal product of \$10 per hour. There are equal numbers of workers of each kind. Employers cannot tell which kind of worker an applicant is when he applies for work. Finished output is simply dumped into the communal output bin as it is completed so that the output of each worker cannot be determined, even after it has been performed. Workers get no disutility from work, once they are at the job site. At the end of the day total output is evaluated, and each worker is paid an equal share of the total output.

Answer the following questions:

- A. Assume the employers are perfect competitors for labor. What is the equilibrium wage? Explain, briefly.
- B. Assume that Tri-County Tech offers a (no tuition) course in price theory. The course does not affect productivity on the job, and high productivity workers regard taking this course to be just as bad as accepting a \$3 per hour pay reduction. Low productivity workers regard it as bad as accepting a \$6 pay cut. Upon successful completion of the course, a worker is given a certificate which he may show potential employers attesting to his success. Will workers take the course in equilibrium? Why or why not?
- C. Suppose the instructor in the price theory course tells sophisticated jokes. The jokes are not understood by the low productivity workers, and so do not affect how they feel about the course. But the more productive workers both understand and enjoy the jokes, so they now regard the class to be only as bad as accepting a \$2 per hour pay reduction. How would your answer to the previous question change? Explain carefully.
2. Assume that the labor market is composed of firms employing workers of various skill levels. There are male and female workers at each skill level. Males and females are equally productive at each skill level. Assume that males are prejudiced against female workers.
- a. Assume initially that it is costless for firms to recruit workers at each skill level. Explain:
- Whether or not male and female workers will earn the same wages.
 - How males and females will be distributed across firms.
- b. Now assume that it is costly for firms to recruit workers at each skill level. That is, firms must engage in costly advertising and interviewing to find the right person for each task. Explain:
- Whether or not male and female workers will earn the same wages.
 - How males and females will be distributed across firms.
- c. Propose specific empirical tests for the hypotheses you propose in part (b). In doing so, identify the factors that will affect recruiting costs. Explain how you would measure such factors and how changes in these factors should be systematically related to the male-female wage gap and the gender composition of workers within each firm, under the maintained hypothesis that men are prejudiced against women.

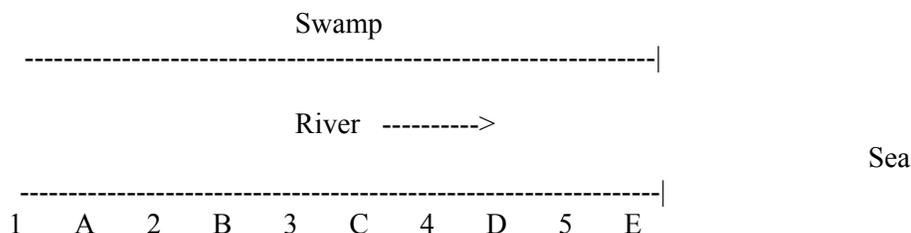
1. Agricultural policy-makers have devised schemes for reducing output with the goal of improving the welfare of farmers. One way to reduce output is by imposing a restriction on a single input as in the case of acreage restrictions which establish maximum acreages that farmers are permitted to plant to certain crops like corn or wheat; another is to impose a maximum quota on output as in the case of tobacco or peanuts.

A. Show the farmer's optimization strategy under each case.

B. What are the welfare implications of the two schemes? Which do you prefer? Why?

2. In 1348, the bubonic plague swept into central Europe carried by fleas on the backs of dogs. In two years, one-third of the population was dead. The black death subsided, but recurred with a lower death toll approximately every ten years into the 15th century. Is it possible that the per capita income of Europe rose during this period? On the flip side, some people argue that welfare is diminishing today due to population growth. Some go so far as to say, cynically, that we need another plague. Is it possible that current population growth is responsible for declining welfare? Make sure that your answers across these centuries mirror each other.

The north shore of the Choptank River consists of swampland on which nothing can be built. Thus, all development occurs along the south shore, along which are both industrial firms (indicated in the map below by capital letters “A”, “B”, and so forth) and households (indicated by the numerals “1”, “2” and so forth). The river flows from west to east, emptying into the sea.



Here are the other key facts:

1. Each month each of the firms emits 12 units of an unpleasant smelling chemical into the river, which flows downstream.
2. Each household likes to swim in clean water; the distaste it suffers from chemicals in the water amounts to \$1 for each gallon of the chemical that is in the water that flows in front of its house.
3. Each firm could completely eliminate its chemical emissions by using a filter that costs \$40 per month to operate.
4. Each household could lease its own swimming pool (and thus avoid having to swim in the river) at a cost of \$40 per month.

Here are the questions:

- a. Construct a simple table, or matrix, showing the potential damages done by each firm to each household.
- b. Even though these facts are known to us, assume that initially no one is able to determine which firms are dumping chemicals into the water, nor how much they are dumping. How many (and which) firms will install filters? How many (and which) households will install swimming pools? Explain your answers.
- c. Now suppose that the invention of a new measuring device makes it possible to costlessly determine which firms are dumping chemicals into the river. Political agitation by households leads to passage of a law that requires all firms to halt chemical dumping. Does the law result in a net benefit or loss to society? Explain.
- d. Assume now that economists study the law's consequences and report their findings to the legislature, which amends the law to permit firms to either (i) install filters, or (ii) compensate households for any damages done to them by the firms' chemicals, or (iii) pay for the rental of swimming pools. How many filters will be installed? How many swimming pools will be rented? Explain, being sure to indicate where the filters and swimming pools will be located.
- e. Does the amended law mentioned in part (d) yield a net gain or loss relative to the outcome in (b) and relative to the outcome in (c)? Explain, briefly.

1. Increasingly, the practice of long distance providers is to charge a minimum monthly fee in conjunction with a low per minute charge per call. For example, national advertisers such as 10-10-321 and 10-10-811 both do it.

a. Explain this practice as a price discrimination scheme. In particular, what is the effect of the minimum charge? What is the relationship between the minimum charge and the total bill of the marginal customer? What is the relationship between the minimum charge and the total bill of the average customer?

b. Is it possible that this practice is not price discrimination but is instead cost-based? What empirical evidence would you use to distinguish between a cost-based explanation and price discrimination?

c. If the practice is price discrimination, is it possible that such a practice can exist in a competitive market? Alternatively, are we forced to assume that the long distance telephone market is monopolized if this practice of charging a minimum bill is shown to be price discrimination?

2. Harrah's is considering two, mutually exclusive projects in Mississippi. One is to start a gambling casino that will only last for 10 years because the land upon which it will be built is deeded to a wildlife conservancy and reverts to their control in 10 years. The other project would place a casino on land that can be acquired by Harrah's. Hence, the project has an indefinite (i.e., infinite) life. The two projects have identical present values given the current tax structure. However, the state is debating whether it should impose a new "gambler's levy" on such projects.

Answer the following questions:

- (i) Which project has the higher cash flows?
- (ii) If the state imposes the "gambler's levy" in the form of a property tax, what will be the effect on the relative attractiveness of the two projects?
- (iii) What happens to the relative present values of the two projects if the "gambler's levy" takes the form of a tax on casino profits.

Consumers buy appliances (e.g., washing machines) that last for a number of years. As the consumer keeps the appliance for more years, he spreads the initial cost of the appliance over more years. But he also incurs larger repair bills, because older appliances require more frequent repairs.

To answer the questions below, assume the following:

P = purchase price of an appliance,
 w = price of an appliance repair,
 n = total number of repairs over the useful life of the appliance,

where

$$n = \frac{u^\beta}{a}$$

and

u = useful life of the appliance ($u \geq 0$),
 a = durability factor ($a > 0$), and
 $\beta > 1$.

Assume throughout that

The interest rate is zero.
 The scrap or trade-in value of the appliance is zero.
 The price of a new appliance (i.e., P) is constant through time.
 The energy usage for an appliance is the same, regardless of the age of the appliance.

- a. What is the annual cost (or implicit rental price) for an appliance?
- b. Explain how a consumer decides how long to keep the appliance. That is, determine the consumer's choice of the useful life (u) of an appliance.
- c. Demonstrate that β is the elasticity of the total number of repairs over the useful life of the appliance with respect to its useful life.
- d. Maytag (a manufacturer of appliances) advertises that its appliances need fewer repairs than appliances manufactured by other firms. Not surprisingly, Maytag appliances have higher purchase prices than appliances made by other firms. If Maytag appliances do need fewer repairs each year and do have higher prices than other appliances, would you expect Maytag appliances purchasers to hold their appliances longer than purchasers of other appliances? Explain. (Assume that β is the same for all appliance manufacturers.)
- e. (Much harder--don't waste time here.) If Maytag appliances of a given age need, say, one-half as many repairs as any other manufacturer's appliances of the same age, by how much will the price of new Maytag appliances exceed the price of other new appliances?

1. Labor's share of an industry's costs is the elasticity of output with respect to labor if and only if the industry's production function is of the Cobb-Douglas type.
2. *Ceteris paribus*, an industry's demand for a factor of production is always less elastic, the smaller that factor's share of total industry costs.
3. If a firm has two plants that differ in efficiency, the firm will operate only the more efficient of the two.
4. A binding legal ceiling on interest rates will increase the amount of money loaned if the lender is a monopolist.
5. A ban on the sale of used textbooks would cause an increase in the equilibrium price of new books, at least until new publishing firms entered the market.

1. The greater the number of “middlemen” within a supply chain, the higher will be the final cost of a consumer product.
2. If a competitive firm has the production function is $X = AL^\alpha$, then the elasticity of the firm's demand for labor is equal to $1/\alpha$.
3. If widgets are an input to the production of gadgets, and if both Amalgamated Gadget and International Widget are monopolists, Amalgamated would reduce its cost of producing gadgets by acquiring International.
4. At the typical university, professors' salaries are the single largest component of total cost. It follows that in the higher-education industry the demand for professors is more elastic than the demand for clerical and custodial staff.
5. The supply curve of a perfectly competitive industry can never be negatively sloped.
6. Given a competitive industry using a constant-returns-to-scale production function $f(L,K)$, the greater is the elasticity of supply of L to the industry the more elastic is the industry's demand for K.
7. When a perfectly competitive equilibrium exists, it is always Pareto optimal.

Venezuela usually produces between 4 and 5 percent of the world's supply of crude oil. In opposition to the government of Hugo Chavez, Venezuela's workers have called a general strike, shutting down oil production there. Answer the questions that follow both specifically and comprehensively

A. How would you provide a back-of-the-envelope upper bound estimate of the effect of this strike on gasoline prices in the United States? (Assume that 50% of U.S. gasoline is refined from imported crude oil, and that 20% of U.S. imports of crude oil come from Venezuela.)

B. In what sense is your estimate an upper bound estimate of the effects of the strike on U.S. gasoline prices?

C. What is your lower bound estimate of the effects of the strike on U.S. gasoline prices?

The Department of Petroleum Exploitation (DOPE) in the country of Luxor recently instituted a program to limit the production of oil by producers in their country. This program involves the imposition of quotas on the amount of oil produced by each producer.

There are two groups of producers in Luxor. The marginal cost curve of each member of the first group of producers (the "low-cost producers") is given by

$$MC = 6 + .05Q.$$

The marginal cost curve of each member of the second group of producers (the "high cost producers") is given by

$$MC = 12 + .05Q.$$

There are 100 members of each group of producers. The world price of oil is $P = \$24$ per barrel. (In answering the questions that follow, assume that this is a one period problem.)

- A. (5 pts.) What is the "demand curve for quota" for a typical producer in each group? Be explicit. (NOTE: To avoid confusion, let R represent the price of quota.)

Under its program to limit oil production, the DOPE has decided on a quota of 180 barrels of oil for each producer.

- B. (10 pts.) Assume the DOPE does not allow the sale of production quotas among producers. What will be the (i) marginal and (ii) total cost of production of each producer? What will be the net income (producer surplus) of each producer? Show your calculations clearly and carefully.
- C. (8 pts.) Now assume the DOPE decides to allow the sale of production quotas among producers. What will be the market clearing sale price of quota (R^*)? How much oil will be produced by producers in each group after the market for quota has cleared? What will be the net income (producer surplus) of producers in each group?
- D. (12 pts.) Compared to the situation with quota, but without transferability of quota, what is the impact on the following of having transferable quota (i.e., transferable production)?
1. total production and production by firms in each group
 2. the total costs of producing oil in Luxor
 3. the net incomes (producer surplus) of producers in each group.

Show your reasoning in each case.

Consider a manufacturing company, Iorta, that sells a product, Ravicept, both in the United States and worldwide. Ravicept is a chemical compound made from corn that increases the strength of titanium alloys. Ravicept is under patent in the United States, which allows Iorta to set a monopoly price. However, Iorta's patent rights to Ravicept are not recognized internationally, so while Iorta sells Ravicept in the world market, it faces competition and is forced to sell the product at a price determined by perfectly elastic supply from world-wide manufacturers.

- a. Assume that Iorta charges a single monopoly price in the United States. What is the relation between the worldwide price and the monopoly price in the United States?
- b. Assume that U.S. regulators increase Iorta's cost of producing Ravicept by imposing new and meaningless work rules at Iorta's manufacturing facilities. If Ravicept continues to sell in the world market what will happen to the price in the United States.
- c. Is it possible that Iorta will stop selling the compound internationally? If so, what will happen to the price in the United States?
- d. What would happen to the price of the compound both domestically and internationally if the price of corn increases?

It is nearly Spring, and Professor Blitz is thinking about buying a vacation home in Montana. He has heard from his colleagues that, because of its terrible weather the rest of the year, vacations in Montana are suitable only during June, July, and August. Being a professor at a certain southern university, Blitz happens to be able to reside in his prospective vacation home during all of June, July, and August.

There is a well-established rental market for houses like the one Blitz might buy, so he can forecast with certainty that he could rent his property to other people for \$5,000 per month during each of those three months (and zero in any of the other months). Assume that each month's rent payment is received on the first day of the month in which it is rented. Also assume that Blitz can choose from among a number of identical houses, some of which are rented and some of which are occupied by their owners during June, July, and August. Finally, assume that this market is in long-run equilibrium.

- A. **(10 pts.)** If no change in demand or supply conditions is anticipated, what will be the time path of the price of a vacation home in Montana over the course of a year? When will the purchase price of one of these vacation homes reach its maximum? When will it reach its minimum? Be explicit and precise, not vague. Explain.
- B. **(10 pts.)** Now suppose that new information is made public that makes it certain that the monthly rental rates of these houses will be \$6,000 per month (i.e., 20% higher) next year, and will stay at that new level in subsequent years. If this news is announced late on May 31 of this year, how will the purchase prices of these houses change over the course of the ensuing year? Explain.

Today, drug companies spend large sums to determine additional uses for their existing drugs. For example, Glaxo, a pharmaceutical giant, learned that its drug bupropion hydrochloride (abbreviated BH) is more effective than the nicotine patch for people trying to quit smoking. When sold to people who wish to stop smoking, BH is sold as Zyban, but BH originally was introduced in 1997 as an antidepressant called Wellbutrin. Projected 2003 sales were \$240 million for Zyban and \$600 million for Wellbutrin. Glaxo currently sells both drugs for \$1.20 per pill.

Suppose initially that the “choke price” (i.e., the price at which consumers refuse to buy anything) is the same for both Zyban and Wellbutrin.

A) Assuming for simplicity that the relevant demand curves can be approximated as being linear, what are the demand curves for Wellbutrin and Zyban and the total demand for this drug, BH? Show us the algebra and the graphical representations, being sure to explain your notation and label all relevant points in the graph(s).

B) Why does Glaxo, the monopoly producer, set the same price for both drugs?

Now suppose that the choke prices for Zyban and Wellbutrin are different (say, P_Z and P_W) but that the estimated slopes of the (linear) demand curves are the same.

C) What are the demand curves for Wellbutrin and Zyban and the total demand for this drug, BH? Show us the algebra and the graphical representations, being sure to explain your notation and label all relevant points in the graph(s).

D) Under these demand conditions, what pricing proposal would you suggest for Glaxo if you were hired as a consultant?
