

1. After graduation, you are hired by a local advocacy group that supports low-income families. You have been asked to provide analysis of two proposals to provide food aid to low income families.

*Proposal 1* would provide each family with \$100 of food stamps per month. These could only be used to purchase food.

*Proposal 2* would subsidize the purchase of food by these families. For each dollar spent on food, the government would provide a dollar of aid, so that the effective price of food to these families is \$0.50.

You have been asked to analyze the effect of this proposal on a typical low-income family with an income of \$500 per month.

- a) Draw a budget constraint for the typical family before aid is provided. Place food on the  $x$ -axis, and other consumption on the  $y$ -axis.
- b) Reproduce your diagram from part (a). Now, add a budget constraint for proposal 1 (the food stamps).
- c) Reproduce your diagram to (b). Add a budget constraint representing proposal 2 (the food subsidy).
- d) Your analysis shows that the typical family buys \$200 worth of food (based on pre-policy prices) when given the food subsidy (proposal 2). Given this, under which proposal is the family better off? Which proposal encourages more food consumption? Explain. Please use your graph from part (c) to help explain your answer. (*Hint*: Calculate how much it costs the family to buy \$200 worth of food under each plan.)

2. The country of Pangaea currently subsidizes gasoline. Concerned over both the environmental impact and the cost of these subsidies, the government is considering eliminating the subsidy. You have been asked to analyze the effect of eliminating the subsidy on both consumers and the government's budget. To begin, consider the following facts for a typical family in Pangaea.

- With the subsidy, gasoline costs \$1.50 per gallon. The typical family purchases 100 gallons of gasoline at this price.
  - The cost of gasoline without any subsidy would be \$2.50 per gallon.
  - The typical family has \$750 of disposable income to spend on gasoline or other consumption goods.
- a) Using an indifference curve and budget constraint, sketch the initial condition with the subsidy. Place other consumption on the  $y$ -axis and gallons of gasoline on the  $x$ -axis. Be sure to show the endpoints of the budget constraint, as well as the levels of gasoline and other consumption chosen by this family.
- b) Reproduce your diagram from part (a). Now, consider what happens when the subsidy is removed and gasoline prices increase to \$2.50 per gallon. Add the new budget constraint to the diagram, along with a new indifference curve showing approximately how much gasoline the family will consume when prices are higher.
- c) Reproduce your answer to (b). To compensate families for higher prices, the government uses the money saved from eliminating the gasoline subsidy to lower income taxes. Suppose that the amount of extra income each family gets is just enough to return their utility to what it was when gasoline was subsidized. Add a budget constraint representing this policy to your diagram.

After taxes are reduced, will families choose to purchase 100 gallons of gasoline, as they did under the subsidy? Explain briefly.

- d) Finally, consider the effects of lowering taxes on government revenue. Compared to what they spent subsidizing gasoline, will the income tax cut cost the government more, less, or exactly the same amount? How do you know this?

3. You are the manager of Meals on Wheels, a non-profit organization that delivers prepared meals to elderly citizens. Five new volunteers have joined your organization, and it is your job to assign each volunteer to a neighborhood where they will make deliveries. Your organization serves two areas: Uptown and Downtown. Based on the distances between homes, traffic volumes, and the number of people served, you have calculated the following data for the productivity of volunteers in each neighborhood:

<i>Uptown</i>				<i>Downtown</i>			
# Volunteers	MP	AP	TP	# Volunteers	MP	AP	TP
0	0	0	--	0	0	0	--
1	24	24	24	1	16	16	16
2	20	22	44	2	14	15	30
3	13	19	57	3	12	14	42
4	7	16	64	4	10	13	52
5	1	13	65	5	8	12	60

Consistent with the organization's goals, your responsibility is to allocate the five new volunteers so as to maximize the number of people served. To do this, how many of the volunteers should be assigned to Uptown, and how many should be assigned Downtown? Explain how you know this (without simply saying that you added up all the combinations and found the largest value – I'm looking for some economic intuition here, and you shouldn't need to spend much time on this question!)

4. Because of your excellent economics background, you have been hired as a consultant to evaluate the operations of King Tutelage, a local non-profit organization that tutors low-income school children. To provide services, the group uses two types of workers: professional staff and untrained volunteers. Because they are in such high demand, the professional staff must be paid the going wage rate of \$25/hour for their services. While the volunteers are not paid, there is a cost to hiring them, since they need training and supervision. King Tutelage has found that they typically spend about \$10/hour for the services provided by volunteers.

While professional staff members are more expensive, they are also more productive. Based on the current employment levels, you find that the marginal product of a professional staff member is 5 (that is, 5 children per hour can be helped). In contrast, the marginal product of a volunteer is 1 (that is, only one child per hour can be helped). Given this information, is King Tutelage making the most efficient use of their resources? Have they hired the appropriate number of each type of worker? If so, how did you determine this? If not, what recommendations can you make to improve their efficiency?

5. A rural electricity district owns two power plants – a hydroelectric plant that can generate power at  $2\phi/\text{kWh}$ , and a natural gas plant that can generate power at a cost of  $4\phi/\text{kWh}$ . Currently, the district generates two-thirds of its power using the hydro plant, and the remaining one-third using the natural gas plant. As a result, the natural gas plant is only operated at one-half of its capacity, while the hydroelectric plant is used at its full capacity. The mayor of Smallville, whose town is served by these power plants, argues that the natural gas plant should be used more, rather than the hydro plant. Because of the gas plant's large size, operating the plant at full capacity would allow the fixed costs of building the natural gas plant to be spread over a larger amount of generated electricity, thus lowering prices for consumers in the district. How would you respond to the mayor's argument?

6. The owner of a small retail store does her own accounting work. How would you measure the opportunity cost of her work?
7. To maximize profits, the firm produces at an output level at which total revenue exceeds total costs by the greatest possible amount. At the same time, profits are maximized at the output level at which marginal cost equals marginal revenue. Can you reconcile these two statements?
8. Consider the following cost data for a perfectly competitive firm:

Q	AVC	MC
6	8.5	8
7	8.571	9
8	8.75	10
9	9	11
10	9.3	12

This company also has fixed costs of \$10.

- a) For the following market prices, find the equilibrium quantity and profits. Be sure to explain how you arrived at your answers:  
i) \$12, ii) \$10, iii) \$9, iv) \$8.
- b) What will be the long-run equilibrium price for this product? Why?
9. This question asks you to consider the market for solar panels produced in China. For this question, please assume that there are many small solar panel manufacturers in China, so that the market is perfectly competitive.
- a) Begin by depicting the market for solar panels in long-run equilibrium. Using two diagrams, one to represent the market for solar panels, and a second to represent the costs of a typical solar panel manufacturer, illustrate the current price, quantity and profits of a typical solar panel manufacturer. Explain why you have drawn the curves as you did.
- b) In an effort to support the development of alternative energy, the Chinese government decides to subsidize the production of solar panels. For example, the government can provide land for solar panel factories below market prices, thus lowering the cost of setting up a factory.
- Reproduce your diagram from part (a) below. Then, show how subsidizing a factory in this way changes the analysis from part (a) in the short-run. How would the short-run profits of a typical solar panel producer in China change?
- c) Will the scenario you have described in part (b) be a stable long-run equilibrium? Why or why not? Once again using separate diagrams for both the industry and a typical firm, illustrate the new long-run equilibrium for the solar panel market in China. Be sure to show any changes between your answer here and your answer in part (b).
- d) China is a dominant player in the global solar panel market, producing approximately 60% of all solar panels. Moreover, their market is almost entirely international. 95% of the solar panels produced in China are exported to other countries. Given China's large market share, how would the subsidies described earlier affect solar panel producers in the United States, who produce less than 5% of the world's solar panels? (A graph isn't necessary here. A written explanation is sufficient.)

**10.** In the village of Pleasantville, residents either work as salaried employees at local offices or are proprietors of stores on Main Street. Salaried employees earn \$30,000 per year. All of the stores are rented to the proprietors by one of several real estate companies who own the buildings. Business is brisk at these stores, so currently the typical store brings in \$70,000 of revenue per year. The typical variable costs needed to run a store in Pleasantville (paying workers, buying material) are \$20,000 year.

- a) What is the opportunity cost of running a store? Explain how you know this.
- b) Given this opportunity cost, what rent will the real estate companies charge? Why?
- c) Suppose that a new highway brings more visitors to town, so that a new store now brings in \$100,000 of revenue per year. What will happen to rents after the increase in revenues? Who will benefit – shop owners or the real estate companies?

**11.** Evaluate the following statement:

“The First Theorem of Welfare Economics states that as long as producers and consumers act as perfect competitors, and there are no other market failures, a Pareto efficient allocation of resources emerges. Thus, if market failure is not evident, there is no justification for government intervention in the economy.”

**12.** For each of the policy proposals below, identify who the potential beneficiaries and losers (if any) are. Then, state whether the change is likely to be:

- 1) a Pareto improvement
- 2) an improvement in social welfare using a Rawlsian social welfare function

Explain briefly.

- a) Providing free health care to low-income families, financed by increasing income taxes
- b) Providing free public wi-fi, financed by an increase in sales taxes
- c) Providing free public wi-fi, financed by a tax on cell phone users.

**13.** Through the miracles of 19<sup>th</sup> century medicine, Earnest’s Extraordinary Elixir has discovered the cure for the common cold. As Earnest is the only one that knows the formula, Earnest has a monopoly on the cold medicine market. The demand for cold medicine is  $P=100 - 5Q$ . The marginal costs of production are equal to \$10. There are no fixed costs.

- a) What is Earnest’s profit-maximizing output and price?
- b) What is the producer surplus that corresponds with your answer to part (a)? What is the consumer surplus?
- c) Suppose that, over time, others learn the secret to Earnest’s Elixir, and the market becomes perfectly competitive. What will the new price and quantity be? Explain how this problem differs from the monopoly problem in part (a).
- d) Find the new consumer surplus and producer surplus in perfect competition. How does the sum of consumer surplus and producer surplus in the monopoly case [part (b)] compare to consumer surplus with perfect competition? Explain any differences between the two.

14. The city of Danville has just built a new public transportation system, designed as a roller coaster that travels throughout the Tri-State area. They need to decide how much to charge riders of the roller coaster transport system. Because of your background in economics, you have been asked by the city to help set the price. The fixed costs of operating the system are \$64,000. In addition, the marginal costs of operation are \$8 per rider. Having researched the demand for the roller coaster transport system in Danville, the city has come up with the following table with price, quantity, marginal revenue, and various costs filled in:

P	Q	MR	AC	MC
48	0	48		
44	1000	40	72.00	8
40	2000	32	40.00	8
36	3000	24	29.33	8
32	4000	16	24.00	8
28	5000	8	20.80	8
24	6000	0	18.67	8
20	7000	-8	17.14	8
16	8000	-16	16.00	8
12	9000	-24	15.11	8
8	10000	-32	14.40	8
4	11000	-40	13.82	8
0	12000	-48	13.33	8

- a) Phineas, a member of the city council, has taken some economics, and wants to ensure that there is no inefficiency, and thus no deadweight loss, from the pricing scheme. What price will achieve this goal? How many riders will use the roller coaster? How much revenue will these riders generate? What will be the total costs of serving this many riders? Will Danville make money, lose money, or break even on the roller coaster transport system at this price?
- b) Dr. Doofenshmirtz, a second council member, prefers that Danville take advantage of its market power whenever it can. He asks you to determine the price at which the city, which has a monopoly as the only provider of roller coaster transportation, would maximize its profit from roller coaster riders. What price would that be? How many riders use the roller coaster at that price? Please calculate the total revenue and total costs, as well as the profit for these sales.
- c) A third member of the council, Perry, is concerned about consumers, and does not want the city to maximize its profits. However, it is important to Perry that the city covers its costs, so that Danville does not lose money on its roller coaster venture. Based on the numbers above, what price should the city set to meet Perry's goal? How do you know this?

At this price, how many riders will use the roller coaster? How much revenue will these riders generate? What will be the total costs of serving these riders? What profit, if any, does Danville make from these riders?