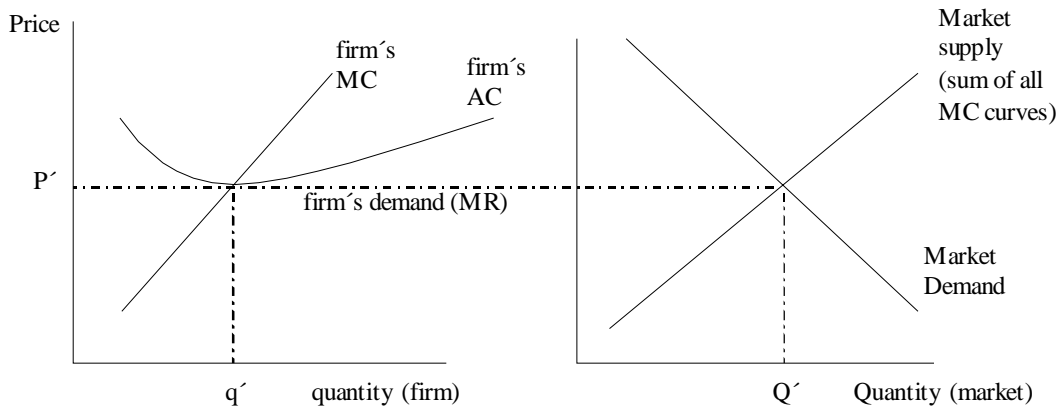


ECON 1 (Lecture 1): **PROBLEM SET #3 SOLUTIONS**

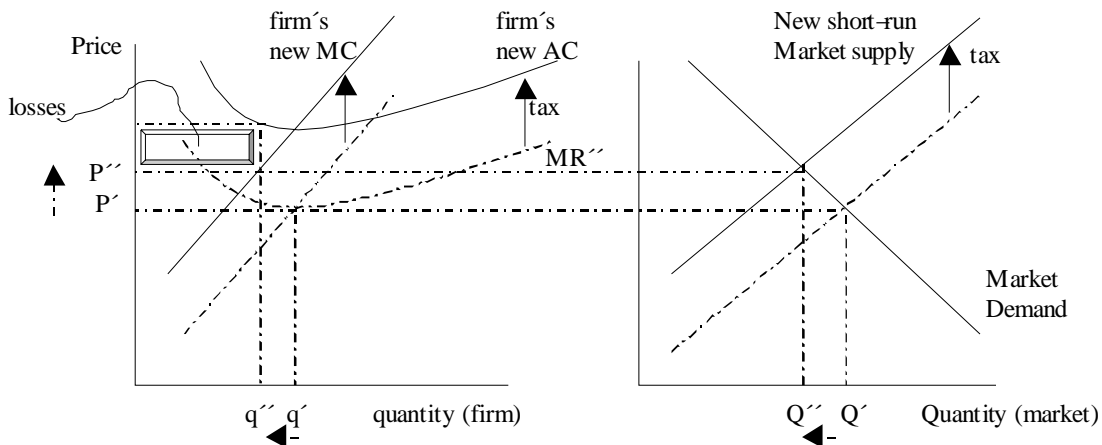
1. Perfect Competition (Chap. 9): Let's assume that the market for croissants is perfectly competitive. The Berkeley City Council decides to tax those delicious items. The Council legislates that a \$0.25 tax be paid on each croissant sold (this is known as an *excise* or *unit* tax, as opposed to a *sales* or *ad valorem* tax, which would be expressed in terms of percentage).

a) Using two separate graphs, show the long-run equilibrium for the croissant industry and profits for a typical firm in this industry before the tax is imposed. Be sure to label your graph carefully.



The profit for each firm is zero (we assume that firms are exactly similar). Each firm is producing at a level where  $P=AC$  (where total revenues are equal to total cost). This is the case in the long-run because positive (negative) profits for the typical firm would induce some firms to enter (exit) the industry, which would shift market supply to the right (left) and bring the price down (up) until profits are again zero. In this model, long-run equilibrium can only happen at a price equal to the minimum of the average cost curve of a typical firm.

b) Explain and show graphically the short-run effects of the tax on the market for croissants on the cost curves of a typical firm, the industry supply curve, the industry demand curve, and the equilibrium price and quantity in the industry.

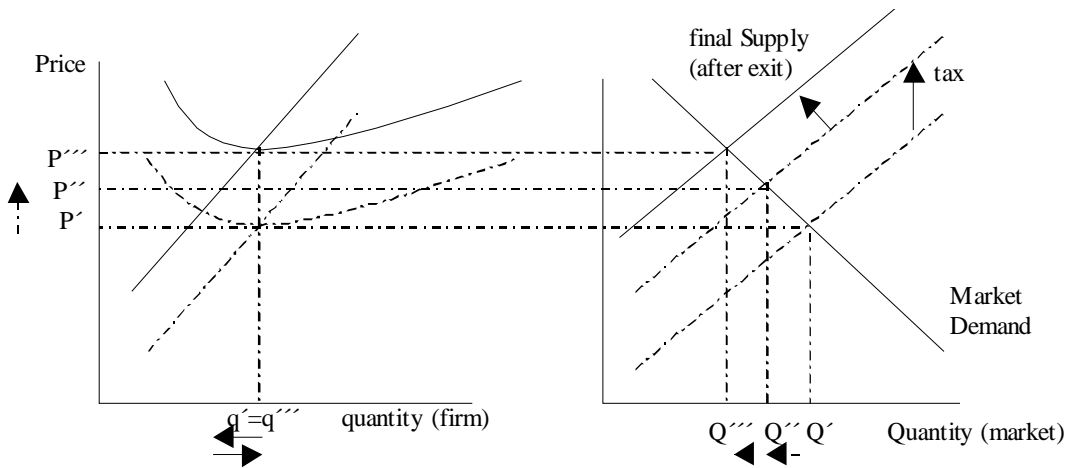


Think of a unit tax (\$0.25 per unit sold) as a vertical shift of 0.25 in a firm's AC and MC curves. Since the market supply is the sum of all MC curves, it also shifts vertically by 0.25, so price increases from  $P'$  to  $P''$ . The important thing to note is that the price increases, but by less than 0.25. The market demand curve is unaffected by the tax, but that does not mean that consumers would still buy the old quantity ( $Q'$ ) at any price ... Equilibrium quantity, for the market and each typical firm, decreases.

c) Explain the effect of the tax in the short run on the profits of a typical firm.

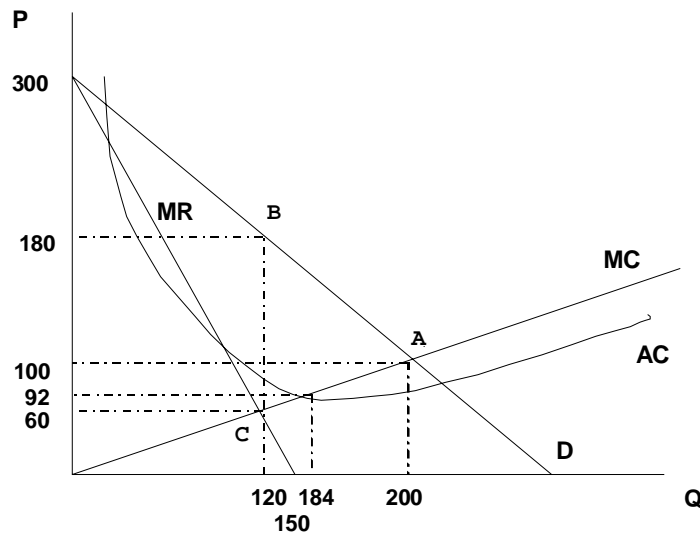
Each firm produces where new MR equals new MC. This occurs at a lower quantity, and results in losses (the highlighted rectangle).

d) Explain and show graphically what will happen to this industry's equilibrium price and output, and to the profits of a typical firm in the long run (what happened to the number of firms?)



If firms are making losses, some of them will exit the industry. Each time a firm exits, the market supply curve shifts left, pushing the price up and reducing losses. This goes on until profits are again zero; not surprisingly, at a price equal to the minimum of the new AC curve. Market price has gone up by the full amount of the tax, and market quantity has decreased. Remaining firms are producing the same quantity they use to, but there are now less of them.

2. Monopoly (Chap. 11): Imagine that you have discovered a type of coffee that makes people stay awake without turning them into neurotic basket cases (a unique product, no doubt) You are granted a patent and therefore your firm is a monopoly. You face revenue and cost curves like the ones in the graph below. Output is measure in tons of beans shipped. You have fixed costs of \$4200 per month.



a) What price will the monopolist charge?

Monopolist will choose to sell the quantity such that  $MR=MC$ . Here, this occurs at  $Q=120$ . Monopolist will charge the highest price that consumers are willing to pay. That amount, of course, is given by the demand curve  $\hat{a} P=\$180$ . (note that  $P>MC=MR$ )

b) What price is socially optimal?

The socially optimal level occurs at  $P=MC$ , where marginal willingness to pay is exactly equal to marginal cost  $\hat{a} P=\$100$ .

c) Calculate (\$) the deadweight loss of the monopoly?

Even though you will not find 'dead-weight loss' in your textbook (won't be in Econ 1 exams either), it is an important concept. It represents the sum of consumer and producer surplus that are foregone when for example, a monopolist produces at a level lower than what is socially optimal. In this case, it can be calculated by the area of the ABC triangle  $\{(180-60) \cdot (200-120) \cdot (1/2) = 4800\}$

d) Would a unit tax on coffee reduce this deadweight loss?

No. Taxes (almost) always reduce equilibrium quantities. If the government's goal is to force the monopolist to produce more, a tax is not the way to do it.

3. Oligopoly (game theory) (Chap 12): Suppose there are only two firms in the glazed sardine business. Each is considering whether to advertise or not. Some consultant (econ 1 graduate) comes up with the following estimates of profits for each of the possible scenarios. Those estimates are summarized in the following payoff matrix:

	Firm B advertises	Firm B doesn't advertise
Firm A advertises	Profit A = 10 Profit B = 10	Profit A = 15 Profit B = 5
Firm A doesn't advertise	Profit A = 5 Profit B = 15	Profit A = 12 Profit B = 12

a) What is Firm A's best strategy for each of Firm B's possible actions?

If Firm B advertises, then Firm A will make larger profits (10 > 5) if it advertises itself. If Firm B does not advertise, it still pays more for Firm A to advertise (15 > 12).

b) What is Firm B's best strategy for each of Firm A's possible actions?

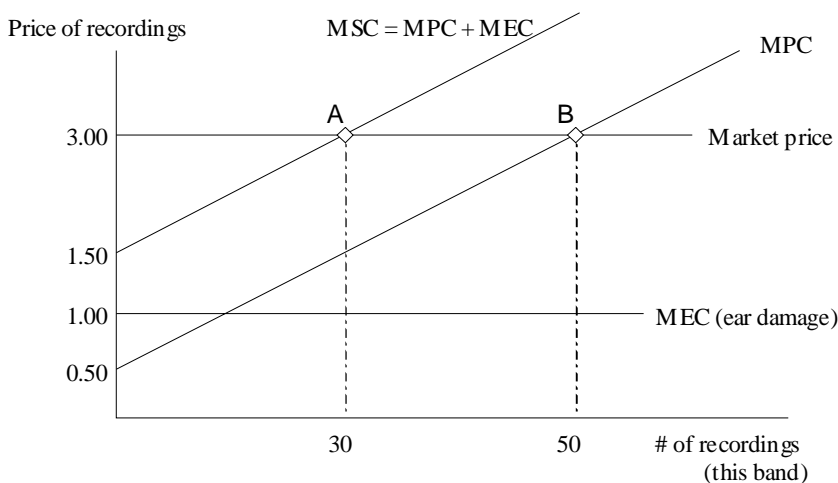
If Firm A advertises, then Firm B will make larger profits (10 > 5) if it advertises itself. If Firm A does not advertise, it still pays more for Firm B to advertise (15 > 12).

- c) Is advertising a dominant strategy for either of them?
- d) If each firm chooses its best strategy, what will be the outcome? Discuss.

No matter what Firm A does, Firm B will always choose to advertise itself (the dominant strategy is to advertise); and vice versa. You thus expect those two firms to end up in the upper-left corner (Nash equilibrium). Things are not always so simple though, and sometimes firms do not have dominant strategies (and there may be more than one Nash equilibrium or none at all).

4. Externalities (Chap 13): The Marginal Private Cost (MPC) for a perfectly competitive death metal band is  $MPC = 0.05q + 0.5$ , where  $q$  is output (# of recordings). The (competitive) market price for such recordings is \$3.00 per unit. The band does not close its windows when recording, thus imposing ear damage on its neighbors. Medical expenses for the neighbors (which you can think of the Marginal External Costs, or MEC) total \$1.00 for each death metal recording they are forced to listen to.

a) Graph the MPC, MEC and Marginal Social Cost ( $MSC = MPC + MEC$ ).



Think of the above graph as an example of the left-hand graph in question 1. Since only this particularly band neglects to close windows, we will not bother showing the market (right-hand graph) and we will take the market price as given. And since we are not interested in profits for this question, we need not show the band's AC curve.

b) Find graphically and algebraically the price and quantity that will be produced by each band in the absence of intervention from the music police (a special branch of

government).

The band cares only about its own costs of producing the recordings (MPC). To maximize its profits, it will set its own marginal cost equal to its marginal revenue (i.e., the market price):

$$MPC = MR \rightarrow 0.05q + 0.50 = 3.00 \rightarrow q = 50$$

The band would choose to produce 50 recordings (pt. B): if it were not for the ear damage, this would also be the social optimum.

c) What would be the socially optimal price and quantity?

Society cares not only about the band's private costs, but also for other costs. So the social optimum will occur where MSC (band's costs plus ear damage costs MEC) equal the value of the recordings (market price, which indicates how much people are willing to pay for those recordings)

$$MSC = P \rightarrow MPC + MEC = P \rightarrow 0.05q + 0.50 + 1.00 = 3.00 \rightarrow q = 30$$

As expected, social optimum (pt. A) would feature less recordings (30). Price is given and remains at 3.00.

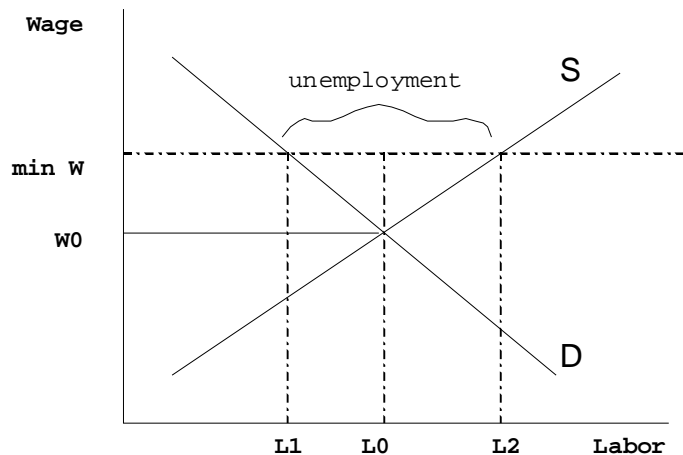
d) How could government achieve that outcome? (think fiscal intervention)

One way to do this would be to put a tax on each recording of \$1.00. (try and see if you can reproduce the results we had in question 1)

5. Labor (Chap. 16): "Imposing a minimum-wage is a bad idea since it increases unemployment among those it seeks to help, teenagers and the working poor." Discuss.

A minimum-wage law acts as a price floor. Relative to a market without intervention, this implies a lower quantity and, of course, a higher price. In the labor market, that means less people working ( $L_1 < L_0$ ), but a higher wage ( $\min W > W_0$ ) for those who keep their jobs ( $L_1$ ). Whether this is a 'bad' idea or a 'good' one may depend on various factors. First, note that for the same initial and minimum wages, you could vary the amount of people losing their jobs by drawing steeper or flatter demand and supply curves. Second, you may consider the trade-off between unemployment and higher wages for employed workers a value judgement. Others may oppose minimum wage laws precisely because it takes the economy away from the social optimum, where demand (P) meets supply (MC) and creates unemployment. Last, some argue that minimum wage laws increase spending, revitalize poor areas, and thus may actually increase employment—that last argument, however, is beyond the scope of this course.

The demand for labor comes from firms wanting to hire workers (the lower the wage, the more it will hire: recall the MRP of labor). The supply of labor comes from workers: if the wage is higher, more workers are interested in working. Without a minimum wage,  $L_0$  workers would be employed at a wage of  $W_0$ .



Link to macro: note that there is no unemployment at a wage of  $W_0$ . Remember the definition of the labor force: it is the number of workers who are either working or are willing to work at the going wage. When that wage is  $W_0$ , the labor force is  $L_0$ : all are employed and the unemployment rate is 0%. When the wage goes up, so does the labor force. The total unemployment created by the minimum wage is made of those who lost their jobs ( $L_0 - L_1$ ) and of those newly attracted to the labor force by the higher wage ( $L_2 - L_0$ ). You could calculate the unemployment rate by  $U = (L_2 - L_1) / L_2$ .

6. Inequality (Chap.17): Why do you think the distribution of income has grown more unequal during the 1980s and 1990s? Is the measure of welfare often used in economics (producer surplus + consumer surplus + government revenues) of much help in discussing this inequality?

To answer this question, you may refer to your notes from the guest lecture by David Card (Monday 3/15/99) and/or chapter 17 in the textbook.

The book talks about three main factors. First, the early 1990s recession was the worst of the post-war era, and it may have been particularly harsh on low-income groups. Second, the continuing shift away from manufacturing activities and toward service and information industries places a premium on skilled labor (this is the 'skill-biased technical change' that David Card mentioned) Third, the Republican administration of the 1980s decreased real spending on programs that were aimed precisely at reducing income disparities.

David Card also talked about changing family structures and the increased presence of women in the labor market. If, for example, lawyers marry lawyers, and GSIs marry GSIs, the disparity between family incomes will be higher than if lawyers considered GSIs suitable partners. Other economists have also pointed (not always convincingly) to the effect of rising immigration, declining union membership, the decline in the real value of the minimum wage, and growing international trade.

The measure of welfare used in economics is not of much use when discussing inequality because it is only concerned with the *sum* of incomes and not their distribution.