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11.203 – Microeconomics   Fall, 2006

Answers to the First Midterm

1) (25 points). At different times, federal, state and local governments have intervened in markets by imposing various price controls. In 1971, President Richard Nixon imposed a partial set of price controls to help reduce the nation's inflation. The controls applied to many goods sold retail to consumers but they did not apply to many goods sold from one business to another. In particular, the law set a maximum price per pound at which chickens could be sold in food stores. But the law did not apply to feed corn that farmers used to raise the chickens. Feed corn prices continued to rise.

a) (10 points) How would you expect the retail market for chickens to develop over time if the maximum retail price of chickens was fixed by law but the price of feed corn used for chickens continued to rise? Illustrate your answer using appropriate diagrams.

Answer: As the cost of feed corn continues to rise while the retail price is fixed, chicken producers recognize they can't make any money. As a result, producers will start dropping out of the market and the supply curve will shift inward.
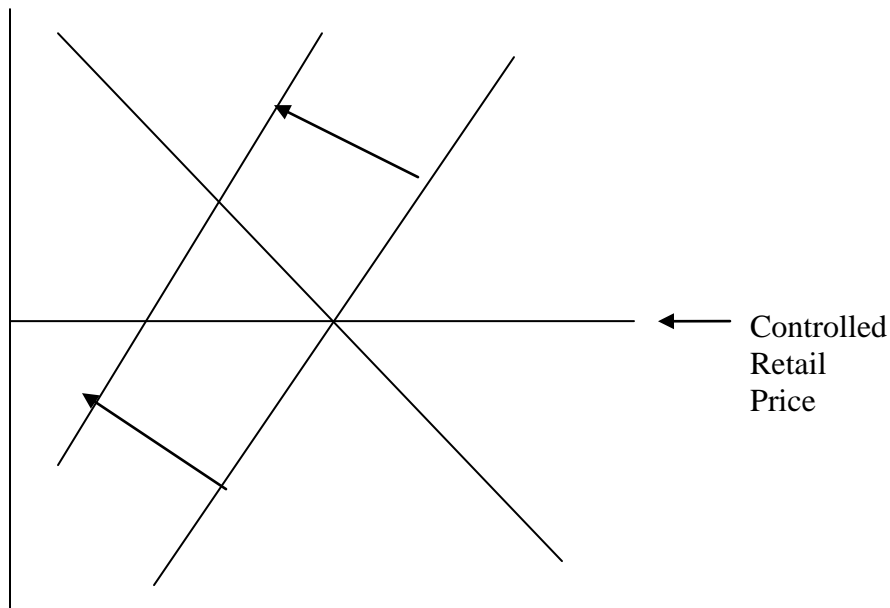
Normally, the supply curve shifting inward would cause the price to rise. In this case, however, the price is fixed by law and so it can't rise. As a result, a gap opens up between the quantity demanded and the quantity supplied at the controlled retail price. (Such gaps are sometimes called excess demand.)

b) (5 points) In a standard supply-demand equilibrium, anyone who is willing to pay the market price can purchase the good. Was that condition likely to hold in the 1971 retail market for chickens? Explain why or why not. If the condition did not hold, describe what other factors beyond price might determine which consumers purchased chickens.

Answer: No, it is not likely to hold. In the standard equilibrium, the price is allowed to rise or fall to bring supply and demand back into balance (in this case, it would have risen). But the legal restriction precludes that. In this situation, not everyone who wants a chicken at the fixed price can get one. Some other factors might be first-come, first served - i.e. who gets to the supermarket early in the morning, bribing suppliers, etc. (As a side note, Rachel Wilch, currently on leave from DUSP to work in New Orleans, wrote last week about bottlenecks in food distribution in New Orleans such that supermarkets' shelves were always empty by mid-afternoon).

c) (10 points) It takes about 60 days to raise a chicken from the time the egg is laid to the time the meat is sold in a supermarket. Under normal conditions, ranchers like to feed a cow for four years before turning it into beef. Assume that 1971 price controls applied to the price of retail beef but not to cattle feed and these retail price controls were expected to continue. How, if at all, would the behavior of the retail market for beef have differed from the consumer market for chickens? Illustrate your answer with appropriate diagrams.

Answer: The difference between the two markets begins with the fact that chicken farmers have a very small amount of supply in the pipeline (60 days) while ranchers have 4 years of supply in the pipeline. If ranchers expect the retail price controls to continue, they, like the chicken farmers will conclude that they can't make money selling cows and this conclusion will apply not to only to new cows, but to cows they are currently raising – i.e. they will lose money by raising a current two-year old cow for the next two years. Therefore, the ranchers may decide to sell off all their stock now and, in the short run, supply may actually increase. In the longer run, the supply curve, like the supply curve for chickens, will shift to the left.

2) (30 points) In 1982, cigarette consumption in the United States totaled about 30 billion packs at an   average price including tax of $.85 per pack. In 1983, Congress passed a general tax bill including a temporary increase of the federal tax on cigarettes from $.08 to $.16 per pack. In 1984, cigarette consumption dropped to 29.5 billion packs.

a) (10 points) Given this information, what was the approximate price elasticity of demand for cigarettes? In your answer, assume the only change in price between 1982

and 1984 involved the change in taxes. Would you describe this portion of the demand curve as elastic or inelastic?

a) Answer: As I do the elasticity calculation, I get:

(deltaQ/Q)/(deltaP/P) = [-.5 billion/30 billion]/[.08/.85] = -.016/.9 = = -.17

So the curve is very inelastic. The only "trick" here is to read the problem carefully to note that the $.85 price includes the original $.08 tax.

b) (10 points) In 1985, the $.08 per pack tax was due to expire. Some experts argued that rather than cutting the federal tax in half, the federal tax ought to be doubled to $.32 per pack on the grounds that it would significantly reduce the likelihood that a person would smoke cigarettes. Explain why you agree or disagree that doubling the tax would have this effect.

Answer: The elasticity estimate in (a) means that increasing the price by 5-6% will cause a 1 percent drop in the quantity demanded. With the tax at 16 cents, the price per pack was $.93 and adding another 16 cent tax would have increased the price per pack to $1.09, an increase in the price per pack of about 15 percent. A 15 percent price increase would cause the number of smokers to fall by 2-3 percent. By most people's definitions of significant, that is not very large.

c) (10 points) Suppose that after analyzing the problem, you were told that during the 1980s, the total number of persons over 15 years old had been growing at 5% per year. Does this fact change your answers to (a) and (b)? Explain why or why not.

Answer: Go back to your original calculation in (a). We calculated deltaQ by subtracting 29.5 billion smokers from 30 billion smokers. When we did this, we were implicitly assuming that without the tax increase from .08 to .16, 1984 cigarette consumption would have been 30 billion, just as it was in 1982.

If the adult population is growing at 5 percent per year, we can assume that the number of smokers is growing at 5 percent per year as well. This means that without the tax increase, the 1984 number of smokers would have been 10 percent larger than it had been in 1982 – something like 33 billion rather than 30 billion. And so our deltaQ would have been - 3.5 billion rather than -.5 billion smokers. There is no need to go into all the numbers here – the key point is that if we know population was growing, we would think that the tax may have been more effective than we thought in (a) and (b).

3) (30 points) You live in Seattle a hundred years from now when human beings have evolved (at least in Seattle) to the point where they consume only two goods: cups of coffee and doughnuts. Coffee costs $3.00 a cup and doughnuts cost $2.00 a piece.

a) (10 points) Economists can never directly observe utility functions—they must estimate utility functions based on observed behavior. After careful study of your buying patterns, a team of economists tell you that your utility function looks like this:

U (C,D) = 12LN(C) + 4LN(D)

Where: C is the number of cups of coffee you drink
     D is the number of doughnuts you eat
     And your income is $64.00

If the economists are right, calculate your utility maximizing combination of cups of coffee and doughnuts.

Answer: Begin with the equation:

$$MUd/Pd \quad = MUc/Pc$$

In English, the marginal utility of doughnuts divided by its price = the marginal utility of coffee divided by its price. (Recall the significance of this equation – if the two terms were not equal, you could shift money from the lower valued term to the higher valued term and increase your overall utility. Conversely equality between the two terms means this no way to increase your utility further and so you must be at the maximum.

To solve the equation, remember that the marginal utility of, say, coffee is the partial derivative of the utility function with respect to coffee.

So the equation becomes:

[(4/D)/$2.00] = [(12/C)/$3.00]

Or: (2/D) = (4/C)

Or: 1/D = 2/C

Or: C = 2D

This means that in the utility maximizing solution, the number of cups of coffee you buy will be twice as large as the number of doughnuts you buy.

Then set up the budget constraint:

$3.00C + $2.00D = $64.00

Substituting in our result above (C = 2D), we get:

$3.00(2D) + $2.00D = $64.00

 Or $8D = $64.00

Or D = 8 doughnuts

And C = 2D = 16 cups of coffee.

b) (10 points) A good's income elasticity is defined as:

$$e_I = (\text{delta } Q/Q_o)/(\text{delta } I/I_0)$$

A luxury good is usually defined as a good with income elasticity greater than +1.0. In other words, holding prices constant, a 1 percent increase in income causes a greater-than-one percent increase in your demand for the good.

A second team of economists completes a somewhat different study on your consumption behavior. After observing you reactions to price and income changes, they inform you doughnuts must be a luxury good for you. Is this conclusion consistent with the specific utility function proposed by the first team of economists?   Explain your answer.

Answer: No, it is not. When you solved the problem in (a), the first part of your answer was C = 2D. We got to that answer before we looked at the budget constraint – i.e. that ratio always holds regardless of income. If we double your income, you will exactly double your purchases of C and D. If income goes up by 10 percent, your purchases of C and D will go up by 10 percent, etc. In other words, your income elasticity for doughnuts = 1.0 where a luxury good requires an income elasticity greater than one.

c) (10 points) Draw a set of indifference curves and budget lines that shows doughnuts behaving as a luxury good.

Answer:
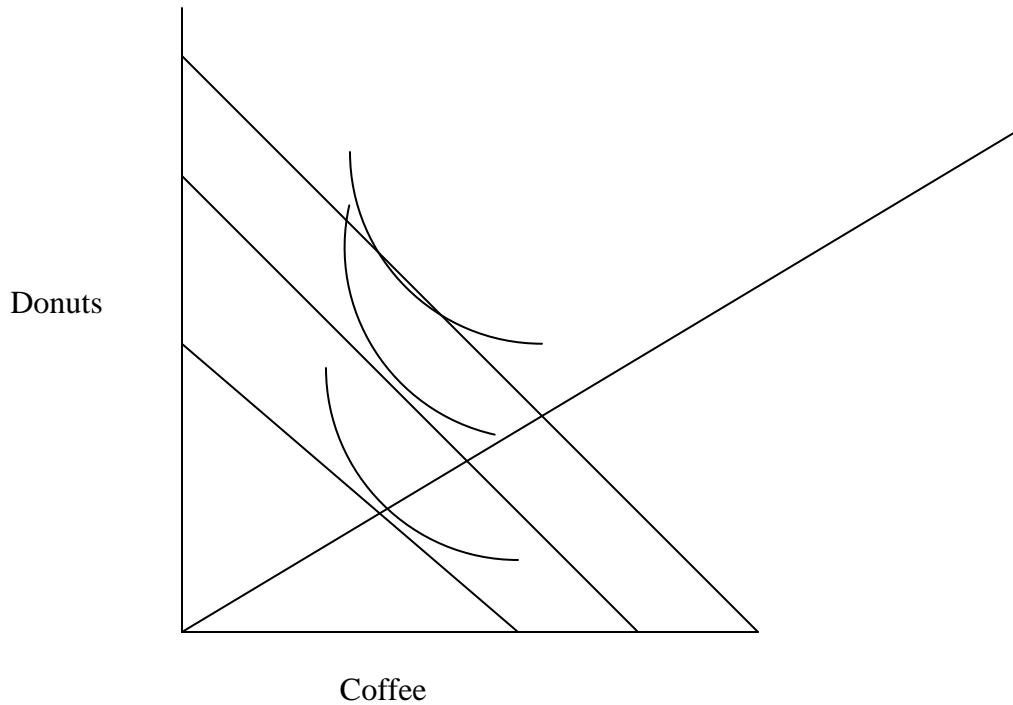
Donuts

Coffee

Terrible drawing I know. The key point I am trying to draw is that as income increases, your purchases of donuts increases faster income. This means the ratio of donuts to coffee has to keep increasing (i.e shifting to the northwest of the budget line).

4) (15 points). The distribution of many economic statistics follows what is called an "80-20" rule, or "90-10" rule etc. For example, "the top 20 percent of our customers account for 80 percent of our profits" (here, "top" means most profitable). Similarly, "the top 10 percent of the items in listed in our catalog account for 90 percent of our sales." (here "top" means the best sellers)

A health insurance company can construct the distribution of expenditure per customer and come up with a similar statement: the top (i.e. most expensive) Y percent of customers account for X percent of our total costs. Consider two possible examples of this statement:

- The most expensive 5 percent of customers account for 95 percent of total cost (but we don't know in advance who these customers are).

- All customers have roughly equal expenditures – e.g. the top 20 percent of customers account for 23 percent of total expenditure.

One of these distributions suggests a possible strategy for holding down the growth of health care expenditures while maintaining basic notions of insurance. Which distribution is it and what is the strategy?

Answer: At first glance, it appears that the first distribution is the good one and your policy ought to be to screen out the high cost people. But there are two problems with this approach. First, the problem says we don't know in advance who the sick ones will be. Second, the problem says the solution must maintain the basic notions of insurance – i.e. we can't say a person is insured for the first $20,000 of medical costs and then they are on their own.

On the other hand, if we have the second distribution, we know that everyone is contributing to cost pressures by roughly equal amounts and these amounts are apparently not extremely large. If we could get everyone to cut back marginally it would have a big aggregate impact. One way to do this would be to put some prices back into the system by having each person pay some fraction – say 15 percent of their medical costs up to some out-of-pocket limit – what is called a co-payment. The fact that each person had to actually pay some cash might cause demand to fall some. Of course, this kind of policy would have little impact in the first distribution since because most of the expense of the top 5 percent would remain even if the people cut back a little.

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