Problem Set 2
Economics 40565
(Due: At the start of class, Thursday, October 11, 2007)

Bill Evans
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1. One of the 'facts' that Cutler et al. attempt to explain with their model of technological change and obesity is the fact that obesity rates have only risen dramatically in the US and not other countries. Search the web for the most recent data on obesity for some European countries. Is this 'fact' no longer true?

2. One potential explanation offered for the risking obesity rate in this country is the 'super sized' meals available at fast food restaurants. What evidence do Cutler et al. provide in Tables 2 and 3 that argues against this hypothesis?

3. People who quit smoking tend to gain weight, and obesity rates of former smokers are much higher than current smokers. In 2001 for example, obesity rates for former smokers are 6 percentage points higher than current smokers. Over the past 30 years, adult smoking rates have fallen from 37 to 22 percent while obesity rates have increased from 15 to 31 percent. Some have suggested that falling smoking rates may be responsible for higher obesity rates. Given the information above, at most what fraction of the rise in obesity can be explained by falling smoking rates?

4. In the Oster model of risk taking and HIV, we calculated the derivative $d\sigma_1/dh < 0$, showing that when the HIV prevalence rate increases, risk taking declines. However, how does this derivative change based on the underlying survival rate of the population, that is, what is the sign on $d[d\sigma_1/dh]/dp$? What does the sign of this derivative suggest about why behavior change after the HIV was greater in the developed versus underdeveloped world?

5. Suppose drivers derive utility from two factors: incomes and taking chances on the road like driving fast. The price of driving fast is the probability of dying so the demand for risk taking on the road should be downward sloping in this probability. Likewise, the supply curve for risk taking is upward sloping indicating that the probability of death rises when risk taking increases. Suppose that the risk of death holding risk taking constant changes because of technological advances like air bags, seat belts, etc. How will this change the supply and demand curves for safety? Will the probability of an accident rise or fall in this situation?\

6. Continuing with the previous question, how might you test whether improving the crash-worthiness of cars alters risk taking among drivers?

7. Many state lotteries have a daily drawing where people can purchase a ticket for $1 with a 3-digit number from 000-999. If the number on the ticket matches the number drawn, the person wins $500. Suppose a person is risk neutral, i.e., their utility is linear in income. In this case U=Y. Show that a risk neutral person will never purchase a lottery ticket. Why then do so many people purchase these types of lottery tickets?

8. Suppose there is an urn containing 30 red balls and 60 other balls than can be either black or yellow, but you do not know the proportions of black and yellow balls. Consider the following gambles:
    Gamble A: You receive $100 if you draw a red ball
    Gamble B: You receive $100 if you draw a black ball
   Consider two other gambles:
    Gamble C: You receive $100 if you draw a red or yellow ball

Gamble D: You receive $100 if you draw a black or yellow ball.

When offered Gambles A or B, the vast majority of people choose A. When offered Gambles C and D, the vast majority of people choose D. Show that the choice of A and D is inconsistent with expected utility theory.

9. Suppose that Betsy's utility function is given by the equation $U=Y^{0.5}$ where Y is measured in thousands of dollars. Betsy's current job pays her $25,000 (Y=25) per year and she can earn this amount next year with certainty. Betsy is offered a different position but in this new job, Betsy has a 50% chance of earning $36,000 (Y=36) and a 50% chance of earning only $16,000 (Y=16). Should Betsy take the new job? Does your answer change if Betsy's utility function is $U=Y^{0.9}$?

10. Bob has a job where he earns Y per year but there is a probability P Bob will be injured on his job. If injured, Bob will not be able to work and his income will fall to zero. Write an equation for Bob's expected utility in the absence of any type of insurance.

11. Continue with the previous problem. Under workers' compensation, if a worker is injured on the job and unable to work, the workers' comp program will pay the worker a fraction θ of their income (Y) in the injured state. If insurance is priced at actuarially fair rates it is easy to show that the premium for insurance is PYθ and assume the premium is paid in both the good and the bad state of the world. Therefore, income in the good state is Y-YPθ=Y(1-Pθ) and income in the bad state is therefore Yθ- PYθ =- Yθ(1-P). Write an equation for Bob's expected utility under workers compensation. In this general case, what is the optimal replacement rate of income in the bad state, that is, what is the utility maximizing value for θ?

12. Continue with the previous problem. Suppose Bob's utility function is U=ln(y) where y is income. We also know that premiums are not available at actuarially fair rates but instead, there is typically a 'loading factor' that prices policies above the fair price. Suppose that the premium price with loading is now kPYθ where k>1. In this situation, income in the good state is now Y-kYPθ=Y(1-kPθ) and income in the bad state is therefore Yθ- kPYθ =- Yθ(1-kP)..With a loading factor k and log utility, what is now the utility maximizing value for the replacement rate θ?

13. Carol has annual income of $50,000 and there is a 1% chance she will experience an accident that will cost her $20,000 in medical expenses. If Carol's utility function is $U=Y^{0.5}$, what is the most she would she be willing to pay for an insurance policy that would cover all her medical costs when they occur. How would this answer change if Carol's utility function is instead $U=Y^{0.1}$. Provide an intuitive explanation for why this value changed the way it did when the utility function changed.

14. In the Rothschild/Stiglitz model, expected utility with insurance is $EU_w = (1\text{-}p)U(W\text{-}\alpha_1) + PU(W\text{-}d\text{+}\alpha_2)$ where α_1 is the premium paid in the good state of the world and α_2 is the net payment (payment minus premium) received in the bad state of the world. In competitive markets, we showed in class that (1-p)/p = α_2/α_1. Demonstrate mathematically that in this model with fair insurance, the utility maximizing choice of insurance will be such that people will equalize income in both states of the world.