Problem Set 2
Health Economics

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1. Suppose we are graphing the health production (H) as a function of medical spending (M) where the function h=f(M) has a positive 1st and a negative second derivative. Fogel and McKeown argue that the rise of agricultural output increased the size of humans and therefore, allowed them to better fight off infectious diseases. Suppose this hypothesis is correct. Graphically illustrate how the rise of agriculture may have altered the health production function. Is this a shift along or a shift in the production function?

2. Data from the National Longitudinal Mortality Survey indicates that among adult males, when income doubles, five-year mortality rates fall by 25 percent. Five-year mortality rates among those with $10,000 in income is about three percent. Given the information above, what are mortality rates among those with $20,000 in income? $80,000 in income?

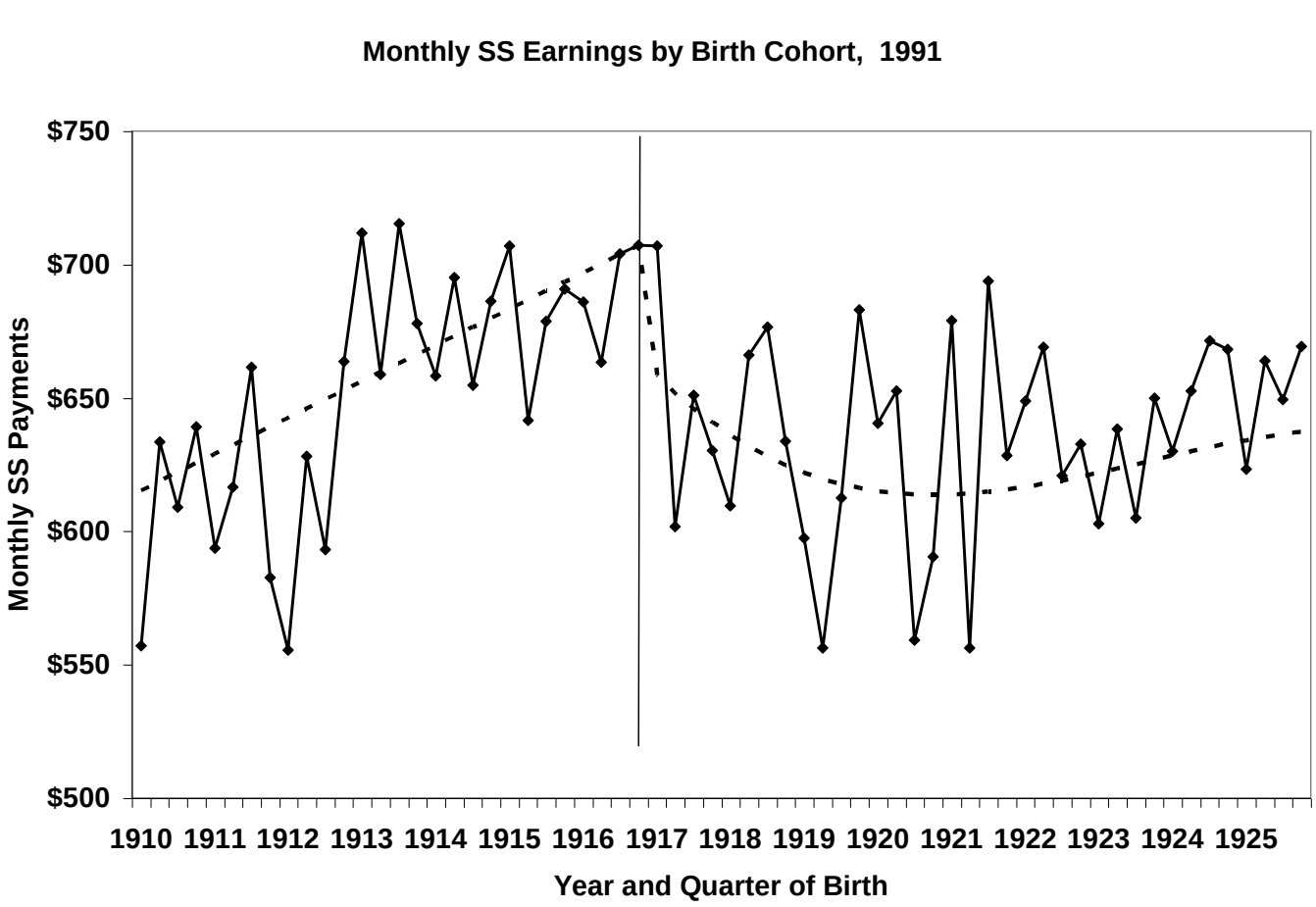
3. Looking at the footnotes to Figure 2.2 in Fogel's article, define what a relative risk of 1 equals. Looking at Figure 2.3 in Fogel's article, what is the (approximate) relative risk of mortality for modern Norwegian males with BMI's of 19 and 31?

4. Using data on five-year mortality rates for US females aged 35 to 85 (M), an author estimates the Gompertz equation that relates log one-year mortality rates to age (A) and finds that in this population, the equation is estimated to be $\ln(M) = -9.944 + 0.0852A$. By how much does the one-year mortality rate increase as a person ages one year? 15 years? What is the predicted *mortality rate* at age 50? At age 65?

5. In an oft-cited paper, an economist demonstrated that in a sample of people with at least a high 3school education, education at age 30 was as good a predictor of smoking status at age 30 as it was smoking status at age 16: those more with years of education at age 30 had lower smoking rates at both age 30 and age 16. What does this result suggest about whether the poorer health habits of lower educated adults are 'caused' by education?

6. A growing body of research suggests that conditions people experience in utero have long term consequences on health. In a series of famous studies, British epidemiologist DJP Barker demonstrates that children born with low birth weight tend to have much higher rates of cardiovascular and lung disease at ages 50 and above. Although this evidence is suggestive, why might one be suspicion about whether this represents a causal relationship?

7. In the mid 1970s, Social Security (SS) payments were increase much faster than revenue growth and as a result, the SS system was predicted to go bankrupt in the not to distant future. To deal with these problems, in 1977, the Federal government for the first time reduced SS payments. Under the new law, those born after January 1, 1917 were to receive sharply lower monthly payments. Therefore, two people, one born in late December 1916 and the other born in January 1916, with the same earnings histories would receive very different SS payments. On the final page of this handout is a graph that shows the monthly SS payments received for males by quarterly birth cohorts (e.g., those born in the 1st quarter of 1916, the 2nd quarter of 1916, etc.). How can you use this fact to test for the casual impact of income on mortality for an elderly population?



8. (The next two question are reviews of difference in difference models). In the early 1990s, the state of Maryland passed a law requiring middle and high school student to complete a minimum amount of volunteer service in order to graduate high school. A researcher finds that among middle school students, the fraction of students that volunteered at least once a month increased from 25% before the law went into effect to 31% after the law. The researcher concludes that the law increased monthly volunteer rates by 6 percentage points?

   A) Why might this be a biased estimate of the impact of the Maryland law on middle school volunteer rates?

   B) A second researchers finds that in the Mid-Atlantic States other than Maryland, monthly volunteer rates among middle school students increased from 23% before the law to 25% after the law. What is the 'difference-in-difference' estimate of the impact of the law on middle school monthly volunteer rates implied by these numbers? (These numbers are actual numbers).

   C) Why might the difference-in-difference estimate calculated in part b) be a biased estimate?

9. In April of 1992, the state of New Jersey increase the state minimum wage rate from $4.25/hour (the Federal minimum wage at the time) to $5.05/hour, an 18% increase in the minimum wage. A research team investigated the impact of the minimum wage law on employment by comparing the change in employment in fast food restaurants in New Jersey before and after the law went into effect (the treatment group) with the same data for fast food restaurants from the Delaware Valley in Pennsylvania (the control group).

a) In Table 2 of the paper, which is reproduced below, the authors compare mean values of some key descriptive characteristics of the stores in NJ and PA at the time of the wave 1 survey (e.g., before the hike in the minimum wage law went into effect in NJ). The final column of the table reports the t-statistic for the null hypothesis that the means are the same across the two samples and there are roughly 470 stores in wave 1. The variables (a) – (e) are store dummy variables, FTE is the number of full-time equivalent employees per store and the other variables should be self explanatory. What are the authors trying to establish with this table? Interpret the coefficient on FTE employment and the starting wage. In these cases, can the authors reject the null hypothesis that the means are the same across the two samples? Overall, are these results in this table "good" for the authors?

b) In Table 3, reproduced below, the authors report the "difference-in-difference" estimates for FTE employment at fast food restaurants. The orientation of this table is different from the 2x2 table we present in class so be careful interpreting the results. The numbers below the estimates are standard errors and for now, just ignore them. What is the change in employment in NJ fast food restaurants between the two periods? In PA? What is the difference in difference estimate? Provide an economic interpretation this coefficient. Do the results make sense?

TABLE 2—MEANS OF KEY VARIABLES

Variable	Stores in: NJ	PA	t^a
1. *Distribution of Store Types (percentages):*			
a. Burger King	41.1	44.3	−0.5
b. KFC	20.5	15.2	1.2
c. Roy Rogers	24.8	21.5	0.6
d. Wendy's	13.6	19.0	−1.1
e. Company-owned	34.1	35.4	−0.2
2. *Means in Wave 1:*			
a. FTE employment	20.4 (0.51)	23.3 (1.35)	−2.0
b. Percentage full-time employees	32.8 (1.3)	35.0 (2.7)	−0.7
c. Starting wage	4.61 (0.02)	4.63 (0.04)	−0.4
d. Wage = $4.25 (percentage)	30.5 (2.5)	32.9 (5.3)	−0.4
e. Price of full meal	3.35 (0.04)	3.04 (0.07)	4.0
f. Hours open (weekday)	14.4 (0.2)	14.5 (0.3)	−0.3
g. Recruiting bonus	23.6 (2.3)	29.1 (5.1)	−1.0

TABLE 3—AVERAGE EMPLOYMENT PER STORE BEFORE AND AFTER THE RISE IN NEW JERSEY MINIMUM WAGE

Variable	Stores by state: PA (i)	NJ (ii)	Difference, NJ − PA (iii)
1. FTE employment before, all available observations	23.33 (1.35)	20.44 (0.51)	−2.89 (1.44)
2. FTE employment after, all available observations	21.17 (0.94)	21.03 (0.52)	−0.14 (1.07)
3. Change in mean FTE employment	−2.16 (1.25)	0.59 (0.54)	2.76 (1.36)