Suggested Answers
Problem Set 1
Economics 43565

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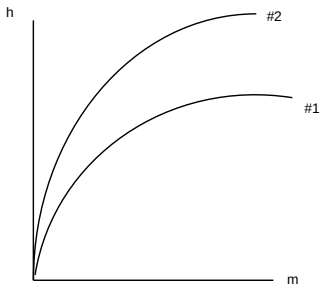
1. Increases in agricultural production should increase both the marginal and average productivity of medical care spending. In the graph below, the health production function shifts up from #1 to #2.



2. Baseline five year mortality rates are 0.03. When income doubles (from $10,000 to $20,000), mortality declines by 25% or by (0.03)(0.25) = 0.0075 to 0.0225. When income doubles again to $40,000, mortality will fall by another 25% by (0.0225)(.25) = 0.005625 to 0.016875. When it doubles again to $80,000, it drops another 25% or (0.016875)(0.25) =0.0043 to 0.0125.

3. Relative risk is the ratio of mortality for a group with a particular characteristic divided by the average mortality for the population. A relative risk of 1 means an average risk of mortality. Looking at figure 2.3, there are four equal step between 0.88 and 2.14 so each step increases the relative mortality by 0.315=(0.214-0.88)/4. So the three lines up from 0.88 represent 1.195, 1.51, and 1.825. Those with a BMI of 19 have a relative risk somewhere half way between 1.51 and 1.195 or roughly 1.35. Someone with a BMI of 19 has a 35% higher mortality rate. Someone with a BMI of 31 has a relative risk of roughly 1.5 or a 50% higher mortality rate.

4. The Gompertz equation explaining mortality at age A is M_A=c exp(bA). Taking the logs, we find that ln(M_A) = ln(c) + bA or, log mortality rate is linear in age. Therefore, taking the derivative of the log mortality equation with respect to age, we find that dln(M_A)/dA = b. The derivative of a log is equal to dln(M) = dM/M which is nothing more than a percentage change in M. Therefore, b=the percentage change in the mortality rate for a one year increase in age.Since b=0.0852, a one year increase in age is estimated to increase mortality rates by 8.52 percent. In this case, mortality rates increase by 8.52 percent for every one year increase in age. A 15-year increase in age will generate a 15(0.0852) = 1.278 or a 1.278 percent increase in mortality. Since ln(c) =-9.944, exp(ln(c)) = exp(-9.944) = 4.80E-5. Using this number, and the original Gompertz equation M_A=c exp(bA), M_A=4.8E-5[exp(0.0852A)]. Plugging 50 and 65 into this equation, we get M_{50} = 0.0034 and M_{65}= 0.0122

5. At age 30, those with more education smoke less. However, the results also suggest that those at age 30 with more education were also less likely to smoke at age 16 as well. The sample contains only high school graduates so everyone at age 16 has the same years of education. Therefore, the fact that education that occurs after age 16 appears to be correlated with higher smoking rates at age 16 leads one

to suspect that the relationship between smoking at age 30 and education is not causal – the same factors that lead one to get additional years of education are the same factors that lead one to smoke. For example, suppose that some people are more forward looking than others. They will be more likely to invest in health and invest in human capital.

6. There are many cofactors that predict high low birth-weight rates, such as low parental socioeconomic status, parental smoking, unhealthy home environment, etc. Unfortunately, these same factors are present after birth and also predict higher cardiovascular disease rates later in life. So although the results suggest a link between in utero conditions and later health, the results could be driven by some unmeasured factor not accounted for in the model.

7. As a result of the law change, the graph illustrates a sharp drop in SS income for those born in 1917 and after. If reductions in income increase mortality, we should see a sharp increase in mortality, relative to trends, for those born in 1917 and after.

8. a) Although it looks volunteer activity among middle school children increased after the law went into effect, we do not know whether the increase was due to the law or an overall secular changes in volunteer activity. Therefore, the results may be biased.
   b) The difference-in-difference estimate is reported in the table below. Although volunteer activity increased by 6 percentage points in Maryland, other states not treated by the law saw in increase in volunteer activity of 2 percentage points, suggesting the actual impact of the law is 4 percentage point increase in volunteer activity.
   c) The estimate of a 4% point increase in volunteer activity is an unbiased estimate so long as the change in volunteer in the Mid-Atlantic states over time represents what would have happened in the absence on the intervention. If participation rates were declining faster (slower) in MD compared to other Mid-Atlantic states, the results over-states (under-states) the impact of the law.

	Time period		
	Before law change (1)	After law change (2)	Difference (2) – (1)
Other Mid Atlantic (1)	23	25	6
Maryland (2)	25	31	2
Difference (2) – (1)	2	6	4

9. a) With these tables, the authors are trying to establish that prior to the minimum wage hike in New Jersey, the treatment (NJ) and control (PA) restaurants look very similar. In general, the results look very good for the authors. In nearly all cases, we cannot reject the null that the means are equal across the two samples. Two caveats are in order. First, the one variable where they do reject the null is FTE employment which is the key outcome in their analysis and therefore, this is not a good sign. Second, as we noted in class, it is not necessary that the means be the same across samples. Rather, we want the trends in the control sample to provide an accurate estimate of what would have happened in the absence of an intervention. Therefore, these results are only a partial victory for the authors.

   b) The coefficient estimate suggests that the minimum wage hike in NJ **increased** fast food restaurant employment by almost 3 workers per restaurant which runs counter to the theory of demand – which is why this paper received a lot of attention when it was released.