Problem Set 2: Labor Supply Responses (and RD)

ECON 24450: Inequality and the Social Safety Net (Deshpande)

Due April 27th, 8am on Canvas

1. **Labor supply theory.** Using the lecture notes as a guide, show that 1) an increase in the wage has an ambiguous effect on labor supply and 2) a traditional welfare program unambiguously reduces labor supply.

2. **Traditional cash welfare vs. EITC.** A single mother, Ann, has three young children and has the following utility function that governs her labor supply decision. The utility function is expressed in terms of consumption, C, and family time, F:

$$U(C, K) = \frac{1}{4}lnC + \frac{3}{4}lnF$$

   There are 168 hours in the week which can be allocated to labor, L, or to family time, F. So $L+F = 168$. The household's consumption is given by its wage w times its hours of labor (assume no income from other sources). The household's budget constraint is therefore $C = wL = w(168 - F)$.

   (a) Given a wage of \$5/hour, sketch the family's budget constraint between weekly consumption and family time. Given her utility function, how many hours per week will the mother choose to work? What will the household's total weekly income be?

   (b) Imagine that there is a traditional cash welfare program that provides assistance to single parent families. The rule is that as long as Ann's earnings are below \$385 per week (below FPL), she is eligible for a cash benefit of \$125/week. Sketch the family's new budget constraint. Will Ann join the welfare program? How much will she choose to work? What will total weekly income equal?

   (c) Now consider an alternative earned income tax credit (EITC) program. The EITC program for a family of four has a phase-in subsidy rate of 40% of earnings during the ascending phase and decreases at a rate of 20% over the phase-out period. The subsidy applies to earnings up to \$200 per week. The phase-out begins at earnings of \$240 per week. Sketch the family's new budget constraint, ignoring the possibility of participating in the welfare program described in (b). For Ann and her three kids, what is the maximum credit? At what point is the credit phase out completely?

   (d) Continue to ignore the cash welfare program. How much will Ann work with the EITC? How much total income will the household have including the EITC? [Hint: to find optimal hours of work, check how much she would choose to work along each segment of the budget constraint.]

   (e) Summarize your findings for hours of work, earnings, transfers, and total income across the baseline, cash welfare, and EITC cases. Compare and contrast the impact of the cash welfare program and the EITC.

3. **Labor supply incentives.** Consider an economy with three types of workers with differing marginal valuations of leisure. Workers have utility functions that can be described as follows:

$$U_i = lnX_i + i \times ln(1 - L_i)$$

   where X_i is consumption, L is labor supply, and i indicates type of worker. One-third of workers fall into each of the three categories: $i = 1/2$, $i = 1$, $i = 2$. Labor supply is bounded between 0 and 1.

The price of private consumption is 1, and the wage rate is also equal to 1 for all workers. All workers have non-labor income equal to 1/4. The following exercises explore the potential work disincentives of welfare programs in this economy.

(a) In the absence of a welfare program, how much labor will workers of each type supply? Explain your answers both graphically and algebraically.

(b) The government notices the distribution of consumption across workers is very unequal. It decides to establish a welfare program. The program guarantees all workers a grant of 1/4, but this grant is taxed away at a rate of one-for-one with labor earnings. How much labor does each type choose to supply under this program? Explain your results both graphically and algebraically.

(c) After introducing the welfare program, the government is surprised by how high welfare outlays are. The administration decides to improve the labor supply incentives of the welfare program by reducing the implicit tax rate on earnings to 1/2 (i.e., by allowing workers to keep half of labor earnings and still participate on welfare). How much labor does each type of worker choose to supply under this program? What happens to total government outlays? Explain your results both graphically and algebraically.

4. **Child care subsidy and budget constraints.** In this problem, we consider how child care costs affect a single mother's labor supply decisions.

   (a) In a standard labor supply model, child care costs are like a decrease in the wage rate: they are a per-hour cost that is paid only for hours that the mother works. Consider an increase in child care costs. In what direction do income and substitution effects move hours of work? In what direction do they move labor force participation? [Hint: think about income and substitution effects for someone who is on the margin of working or not working.]

   (b) Describe the impact on labor supply of a lump-sum child allowance that is phased out as income or earnings rise. Draw the budget constraint.

   (c) Compare the lump-sum child allowance with the effect of publicly-provided child care for all, as is often found in Europe. Show your answer graphically.

5. **Regression discontinuity design.** Later in the class we will study health insurance and the return to medical care. This data exercise is based on the paper "Estimating Marginal Returns to Medical Care: Evidence from At-Risk Newborns" (Almond, Doyle, Kowalski, and Williams 2010), which you should read before starting this question.

   (a) What is the causal relationship of interest in this paper? Write down the structural equation. Note: this equation does not appear in the paper.

   (b) What is the problem with estimating this equation in cross-sectional data? In what direction is the estimate likely to be biased?

   (c) Fuzzy RD is just a form of IV. What is the instrument in this context? Explain how the instrument allows you to get an unbiased estimate of the causal relationship of interest.

   (d) Write down the "first stage" regression discontinuity equation and the "reduced form" regression discontinuity equation. (These do appear in the paper.) Explain each term of the equations and the coefficients of interest.

   (e) Name one or more key threats to the validity of the empirical strategy used by Almond et al. (2010). Be specific to their context. Describe what tests you would perform to assess these threats.

   (f) Download the data set from: http://data.nber.org/lbid/adkw.dta. Import the data set to your preferred statistical analysis program (e.g., Stata, R). By downloading the data set, you agree to the following NCHS data rules: 1) Use the data in this dataset for statistical reporting and analysis only. 2) Make no use of the identity of any person or establishment discovered inadvertently and advise the Director, NCHS, of any such discovery. 3) Not link this dataset with individually identifiable data from other NCHS or non- NCHS datasets.

      i. Replicate Figure 2-A, which gives the main finding of the paper.

A. Group births into 1-ounce (28.3495-gram) bins, radiating outward from the 1500 gram threshold.

B. For each bin, plot the bin's mean one year mortality against the bin's median birthweight.

C. Interpret the graph you created, which is the main finding of the paper.

ii. Test for differences in observable covariates across the 1500 gram threshold (replicate Figure 5-A from the paper).

A. Adapt the method used in (i) to replicate Figure 5-A (the covariate of interest is gestational age).

B. Which RD identifying assumption does this figure support? Explain. **continuity of other variables**

iii. Above, you wrote down the reduced form equation that appears in the paper.

A. Construct a dummy variable $VLBW_i$ that equals one if the infant is classified as very low birthweight (i.e., birthweight strictly less than 1500 grams), and 0 otherwise.

B. Ignore the terms α_t, α_s and δX_i in the reduced form equation. Estimate the reduced form equation by OLS. Obtain heteroskedastic-robust standard errors.

C. Construct a table that contains the estimated coefficients $\hat{\alpha_1}$, $\hat{\alpha_2}$ and $\hat{\alpha_3}$ from the reduced form equation. Report standard errors in parentheses below each estimate. In your table, indicate whether each estimated coefficient is significant at a 1%, 5% or 10% level.