

Remarks on Labor Supply: Substitution and Income Effects

Households have a *utility function* as a function of consumption and labor. The function is decreasing in labor (in other words, increasing in leisure). Households' labor supply is decided by the maximization of the utility function subject to the *budget constraint*: Roughly speaking, the budget constraint looks:

$$\text{consumption stream} = (\text{life time labor income}) + (\text{non-labor income}).$$

1. Pure substitution effect: suppose wage today increases. It has a negligible impact on life time labor income, so that there is no change in the total income (the value of the RHS of the budget constraint). Comparing the gain and loss of supplying labor covered in the last lecture, gain becomes greater, so that households supply labor more as a result of the increase in wage.
2. Pure income effect: suppose that *non-labor* income increases. Here, loss dominates the gain (the gain of labor-income income becomes smaller). Therefore, labor supply decreases.
3. Mixed effect: consider a long-term increase in the wage. Contrary to the first case, it has a substantial income on the value of RHS of the budget constraint:

$$\text{labor income} = \text{wage} * \text{labor supply} = \text{wage} * (\text{time available} - \text{leisure}).$$

Increase in wage entails increase in the value of $\text{wage} * (\text{time available})$, so that the long-run increase in wage entails the income effect along with the substitution effect.

Numerical Example

The marginal productivity of labor of a firm is given by:

$$MPN = A * 100 - N.$$

1. Suppose $A = 1.0$. What will be the demand of labor when the real wage is 10? What if $A = 1.2$? Graph the demand curve for labor when $A = 1.0$ and $A = 1.2$.

In the following we let $A = 1.0$.

2. There are two workers. One has a supply function $N^1(w) = 40 + w$, and another has $N^2(w) = 40 + 2 * w$. Derive the aggregate labor supply function.

3. Derive the labor market equilibrium labor and wage. When $A = 1.2$, are the equilibrium wage/employment higher?
4. Suppose that workers have to pay the income tax with rate t , so that $N(w) = 80 + 3 * (1 - t) * w$. Suppose that $t = 0.33$. Derive the equilibrium labor and pre-tax wage.