ECON 310 - MACROECONOMIC THEORY

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Disclaimer

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Chapter 4: Consumer and Firm Behavior

- Behavior of the representative consumer
- Behavior of the representative firm

Topics

- Consumers/households:
  - Preferences
  - Budget constraints
  - Optimization problem and derive demand for consumption and leisure
- Firms:
  - Production technology
  - Market structure
  - Profit function and derive demand for production

Consumer's Problem

- Focus on one-period or static models [intra-temporal] add dynamics later [inter-temporal]
- Consumers optimize: maximize utility s.t. budget constraint
- Characterization of optimal choice: evaluating trade-offs in consumption and leisure
- Solution as demand functions for consumption and leisure: depends on wage rate and non-labor income

Representative Consumer

- The representative consumer gets utility from consumption and leisure:

$$U(C, l)$$

- Suppose two bundles (C_1, l_1) and (C_2, l_2) - bundle 1 is strictly preferred if:

$$U(C_1, l_1) > U(C_2, l_2)$$

- indifferent if:

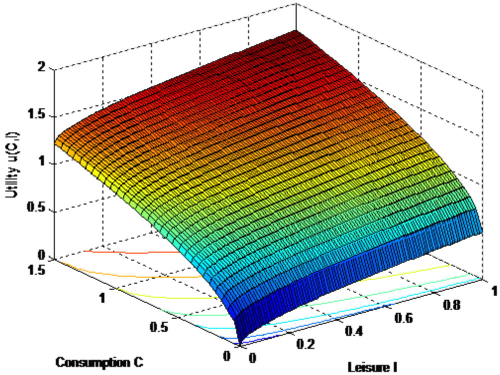
$$U(C_1, l_1) = U(C_2, l_2)$$

- Remember 3 properties of utility curves:
  1. More is preferred to less
  2. Diversity in consumption
  3. Consumption and leisure are normal goods - not inferior goods

Representative Agent: Robinson Crusoe

An example of Indifferent Curves

$U(C, l) = c^{\frac{1}{2}} + (l)^{\frac{1}{2}}$



Contour Plot

Indifferent Curve is locus of all (C,l) points giving the same utility level

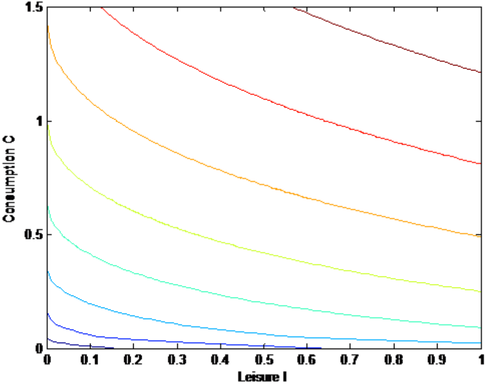
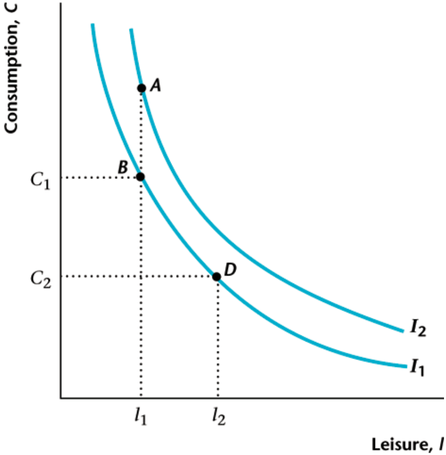
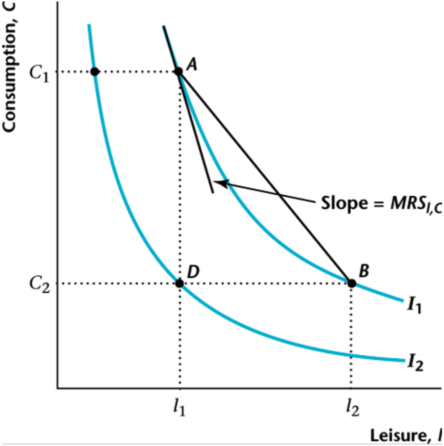


Figure 1: Indifference Curves)



Properties of Indifference Curve

Figure 2: Properties of Indifference Curves



Marginal Rate of Substitution

- Marginal Rate of Substitution (MRS): the rate at which the consumer is willing to substitute leisure for consumption.

- The slope of the curve is equal to the *Marginal Rate of Substitution*

$$\begin{aligned} U &= U(C, l) \\ dU &= MU_C dC + MU_l dl = 0 \\ MRS &= dC/dl = -MU_l/MU_C \end{aligned}$$

Budget Constraint

$$\begin{aligned} C &= wN^s + \pi - T \\ \rightarrow C &= w(h - l) + \pi - T \end{aligned}$$

Budget Constraint

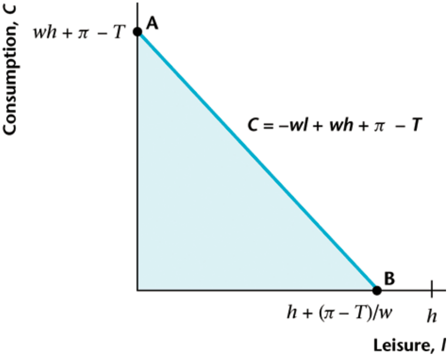
- Rewriting this in terms of the two goods, consumption and leisure:

$$C + wl = wh + \pi - T \tag{1}$$

$$C = w(h - l) + \pi - T \tag{2}$$

- If $T > \pi$, dividend less than taxes $\pi - T < 0$
- If l=0 then $C = wh + \pi - T$
- If C=0 then $l = h + (\pi - T)/w$

Figure 3: Budget Constraint ($T > \pi$)



$$C = w(h - l) + \pi - T \quad (3)$$

- If $T < \pi$, dividend more than taxes $\pi - T > 0$
- If l=0 then $C = wh + \pi - T$
- If C=0 then $l = h + (\pi - T)/w$ but $l > h$
- So suppose $l = h$ or spend all time on leisure still have $\pi - T$ to consume
- Kink at $l = h$
- Possible to consume anywhere below kind $C \leq \pi - T$

Figure 4: Budget Constraint ($T < \pi$)

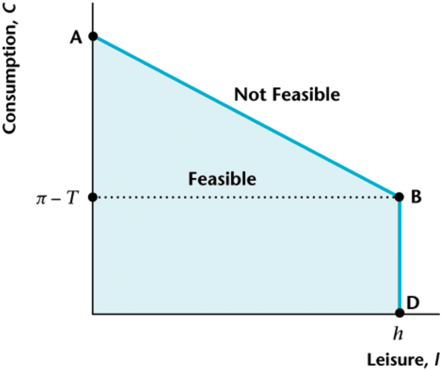


Figure 5: Consumer Optimization

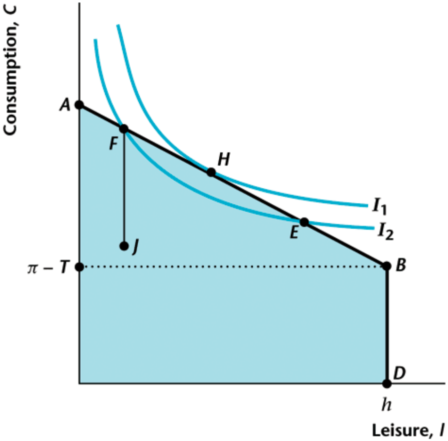


Figure 6: Corner Solution no work!

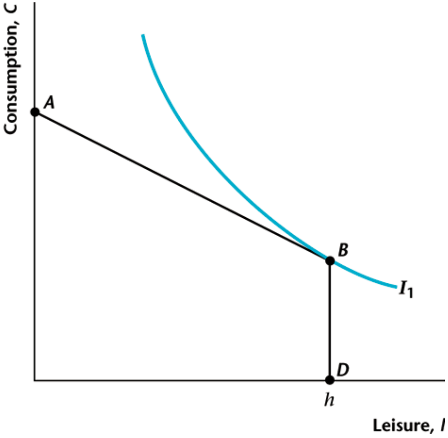


Figure 7: Increase in $\pi - T$

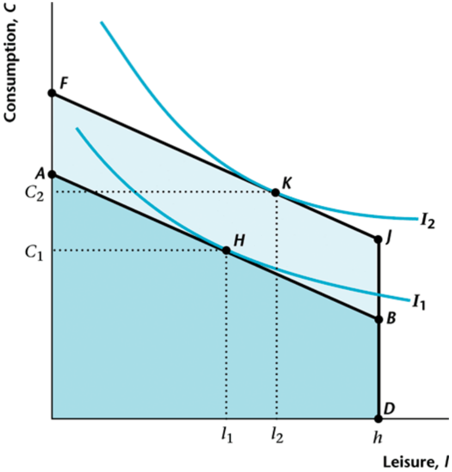
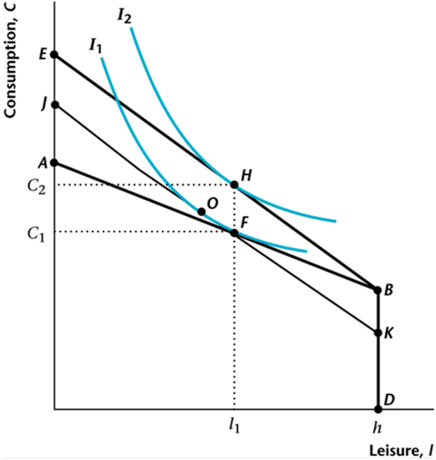


Figure 8: Effect of a Increase in the Wage



Effect of a Increase in the Wage

- See previous figure increase in w pivots the budget line upwards (C becomes cheaper)
- What exactly happens? In the figure decompose 2 effects TE = SE + IE
- Increase in wage increases price of leisure relative to consumption
  - *Substitution Effect:* causes consumption increases and leisure to decrease or N^s to increase
  - *Income Effect:* increase in wage income, cause consumption and leisure to increase

$$Consumption = \underbrace{SE}_{+} + \underbrace{IE}_{+}$$
$$Leisure = \underbrace{SE}_{-} + \underbrace{IE}_{+}$$

- Total effects: if $SE > IE$ then leisure falls if $SE < IE$ then leisure increases

Labor Supply

- Function relates labor supply to the price of labor

$$N^s(w) = h - l(w)$$
$$\frac{\partial N^s(w)}{\partial w} = -l'(w) = ?$$

Figure 9: Labor Supply

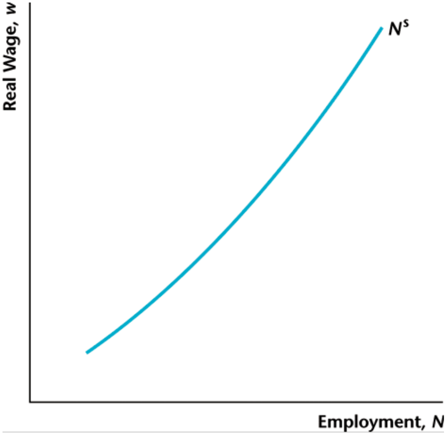
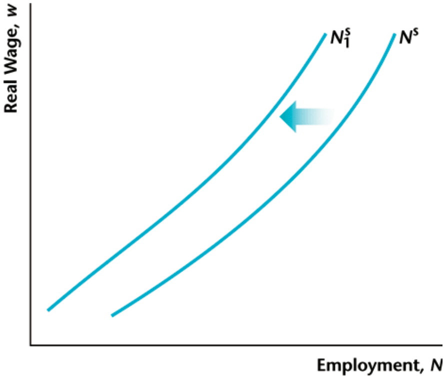


Figure 10: Increase in π or decrease in T



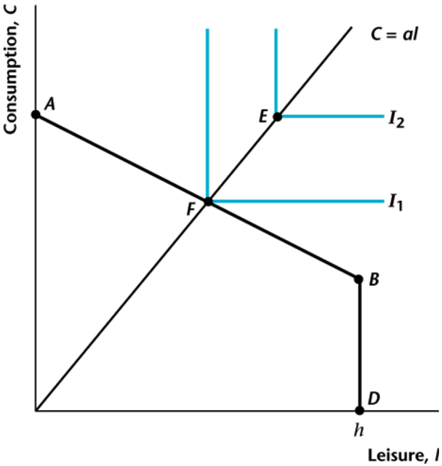
Example: Perfect Complements

- Utility function is:

$$U(c, l) = min[\frac{C}{a}, l]$$

Example: Perfect Complements (cont.)

Figure 11: Perfect Complements



- Assume that real wages are the only factor affecting labor supply

Example: Perfect Complements (cont.)

- Over time real wages increase, while weekly hours decreased
- Downward sloping labor supply? Puzzle?
- Income effects dominate substitution effects
- Other factors: Skill premia, change in labor market participation.
- Macro-labor...

Why do Americans work so hard?

Production Function

- Output is produced according to a production function: $Y = z \times F(K, N^d)$
- z: total factor productivity - higher is z, the higher is MPN and MPK.
- K: amount of capital the firm hires
- N^d: amount of labor the firm hires

Figure 12: Production Function and MPN

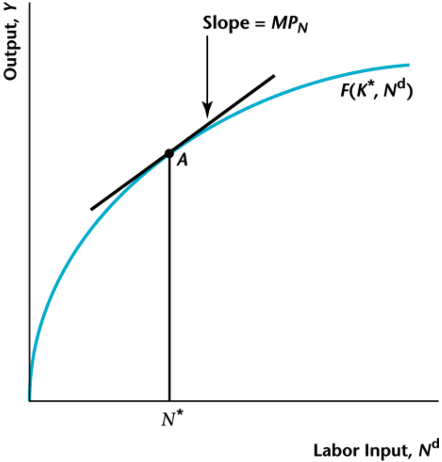
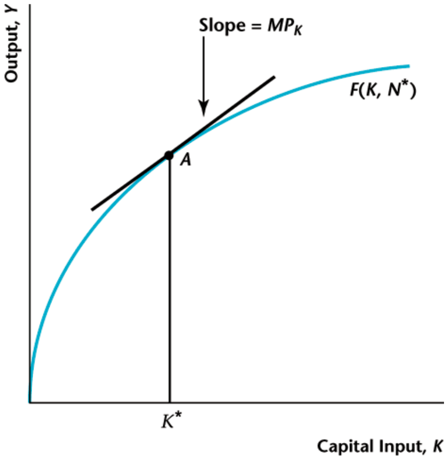


Figure 13: Production Function and MPK



Production Function Properties

- Constant returns to scale (CRS):
  $z \times F(a \times K, a \times N) = a \times z \times F(K, N)$
- Positive Marginal Product of Labor and Capital.

$$\frac{\partial}{\partial K} zF(K,N) = MPK > 0$$

$$\frac{\partial}{\partial N} zF(K,N) = MPN > 0$$

- Diminishing Marginal Product of Labor (and Capital).
- As you increase labor or capital, it's marginal product decreases:

$$\frac{\partial 2}{\partial K2} zF(K,N) < 0$$
$$\frac{\partial 2}{\partial N2} zF(K,N) < 0$$

Production Function Properties (cont.)

- Marginal Product of Capital Increases as Labor Increases (and vice versa)

$$\frac{\partial 2}{\partial K \partial N} zF(K, N) > 0$$

Figure 14: MPN Labor Schedule

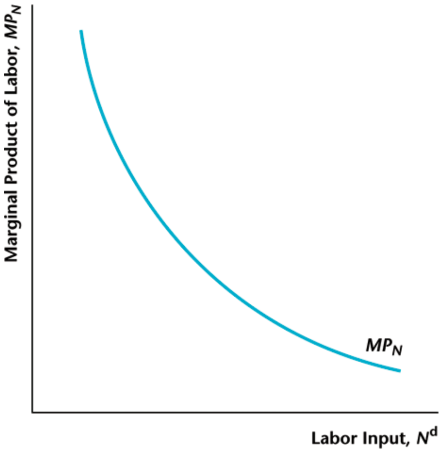


Figure 15: Adding Capital increases MPN, KSC

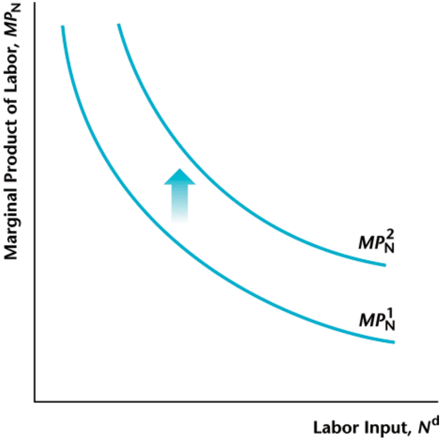


Figure 16: Increases in TFP

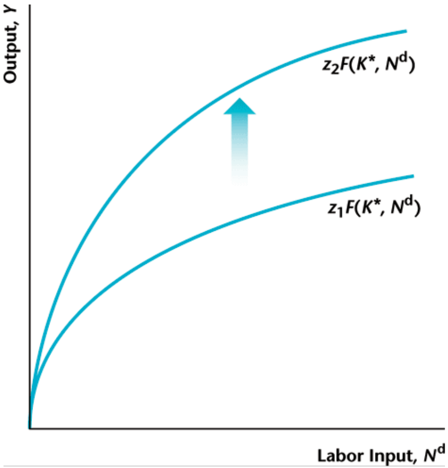
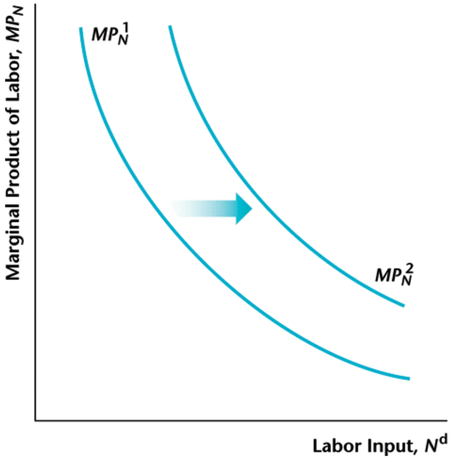


Figure 17: Effect increases in TFP on MPN



Solow Residual

- Production function specification - Cobb-Douglas

$$Y = zK^{\alpha}N^{1-\alpha}, 0 < \alpha < 1$$

- CRS - homogeneity properties
- Capital receives α share of Y and labor $1-\alpha$

$$\begin{aligned} z &= \frac{Y}{K^{\alpha}N^{1-\alpha}} \\ or & \\ ln(z) &= ln(Y) - \alpha ln(K) - (1-\alpha) ln(N). \end{aligned}$$

Figure 18: Solow Residual

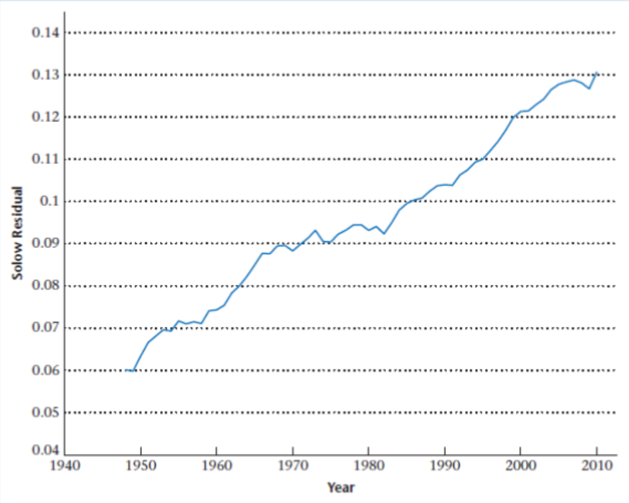


Figure 19: Profit Maximization

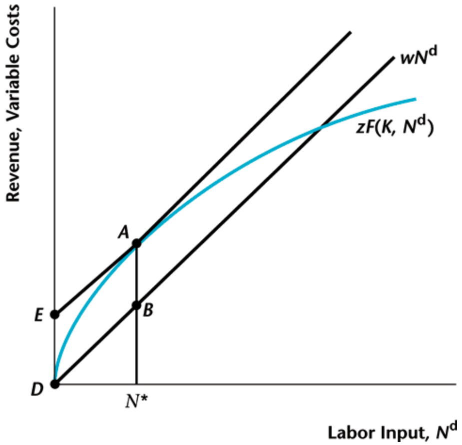
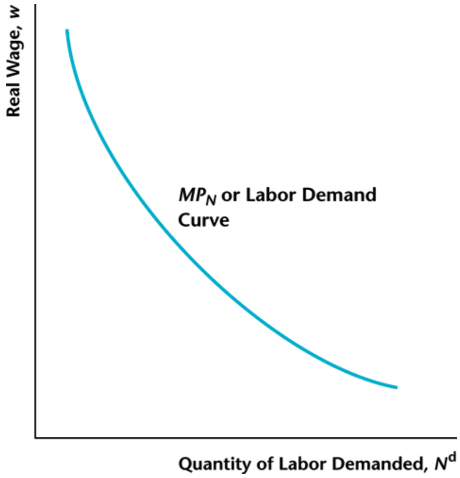


Figure 20: MPN $= N^d$



Productivity in the 2008-2009 Recession

- Problem: Timely measures of total factor productivity are not available, as we measure the capital stock with a lag.
- Can get timely measures of average labor productivity
- Closely related to total factor productivity, but not the same thing

Puzzle

- In the 2008-09 recession, average labor productivity has declined much less than in typical recessions of the same severity.
- Why? Potential reasons are:
  - The causes of the 2008-09 recession are different $\rightarrow$ housing sector problems and problems in the financial system.
  - Long term shifts in employment across sectors $\rightarrow$ from construction and manufacturing to services

Figure 21: Average Labor Productivity

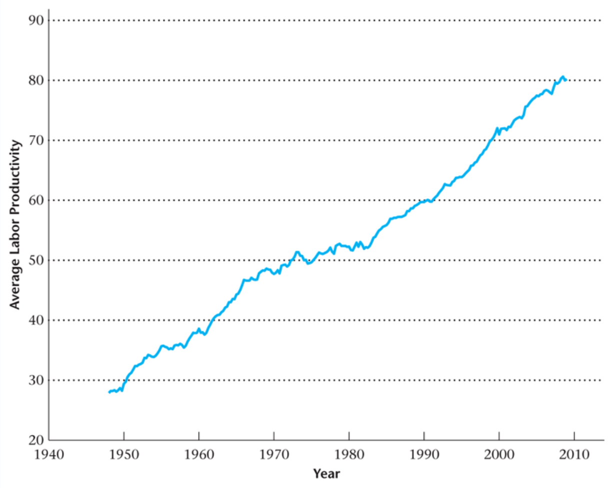


Figure 22: Percentage Deviations from Trend in Average Labor Productivity