LABOR SUPPLY

Last class...

- What is labor economics?
- Supply and demand framework of labor market: labor is bought and sold in the labor market.
    - Buyers/demand = Firms/Producers
    - Sellers/supply = Workers
- Three actors
- Positive economics v.s. normative economics

This class topics…

- Labor market facts
- How to measure labor force?
- Neo-Classical Model of Labor-Leisure Choice
  - Utility function
  - Marginal utility
  - Indifference curve; slope
  - MRS
  - Budget constraint

Introduction to Labor Supply

□ Labor facts

- Men: labor force participation rates declined from 80% in 1900 to 72% in 2009.

- Women: labor force participation rates rose from 21% in 1900 to 59% in 2009.

- Hours worked fell from 40 to 34 per week during the same time period.

Measuring the Labor Force

□ Who: Bureau of Labor Statistics (BLS) reported in the Current Population Survey (CPS)

□ Important terms:
- ◻ Adult working population, P
- ◻ Employed, E
- ◻ Unemployed, U

Measuring the labor force

- The ***Adult Working Population (P)*** consists of those who are over 16 years of age.

$$P = LF + NLF$$

- The ***Labor Force (LF)*** consists of members from the P who are either
  a) *Employed (E)*
  b) *Unemployed (U)*– people not employed but who are actively seeking work or waiting to be recalled from layoff.

$$LF = E + U$$

- The ***Not in Labor Force (NLF)*** consists of members from the AWP who are not employed and are neither looking for work nor waiting to be recalled from layoff.

Figure 2.1 Labor Force Status of the U.S. Adult Civilian Population, April 2013
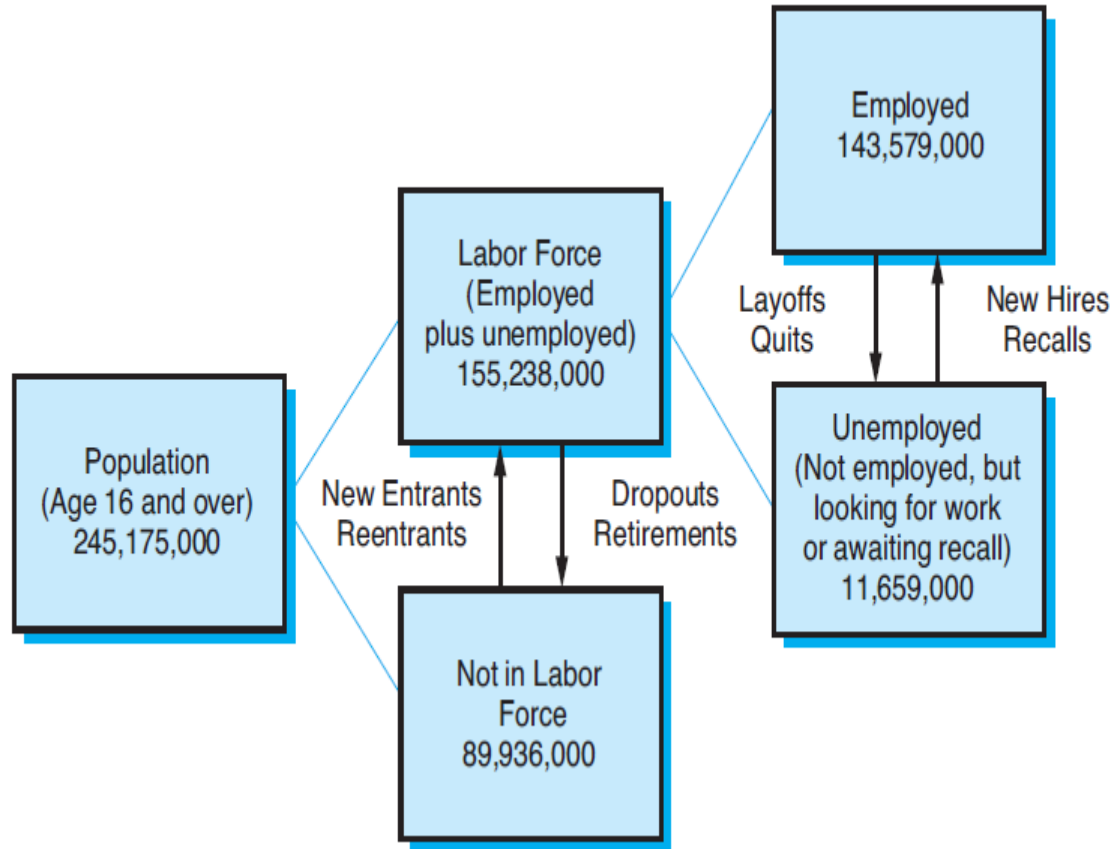
Measuring the Labor Force

- Labor Force Participation Rate
  - LFPR = LF/P
  - P = adult working population

- Employment Population Ratio (percent of population that is employed).
  - EPR = E/P

- Unemployment Rate
  - UR = U/LF
  - LF=# of people in labor force

□ In-class problem 1 : measure labor force

Measuring the Labor Force

- Labor force measurement relies on subjectivity and likely understates the effects of a recession.

- Hidden unemployed (discouraged workers) : persons who have given up in their search for work and have therefore left the labor force.

- The employment rate (E/P) can be a better measure of fluctuations in economic activity than the unemployment rate.

Labor Force Participation Facts

- Labor force participation (LFP) is greatest for all groups during the ages of 25 to 55.

- LFP increases with education.

- LFP has decreased for men over the age of 65 from 63% in 1900 to under 22% by 2010.

Labor Force Participation Facts

- More women than men work part-time.

- More men who are high school drop outs work than women who are high school drop outs.

- White men have higher participation rates and hours of work than black men.

# Average weekly hours of work of production workers, 1900-2013

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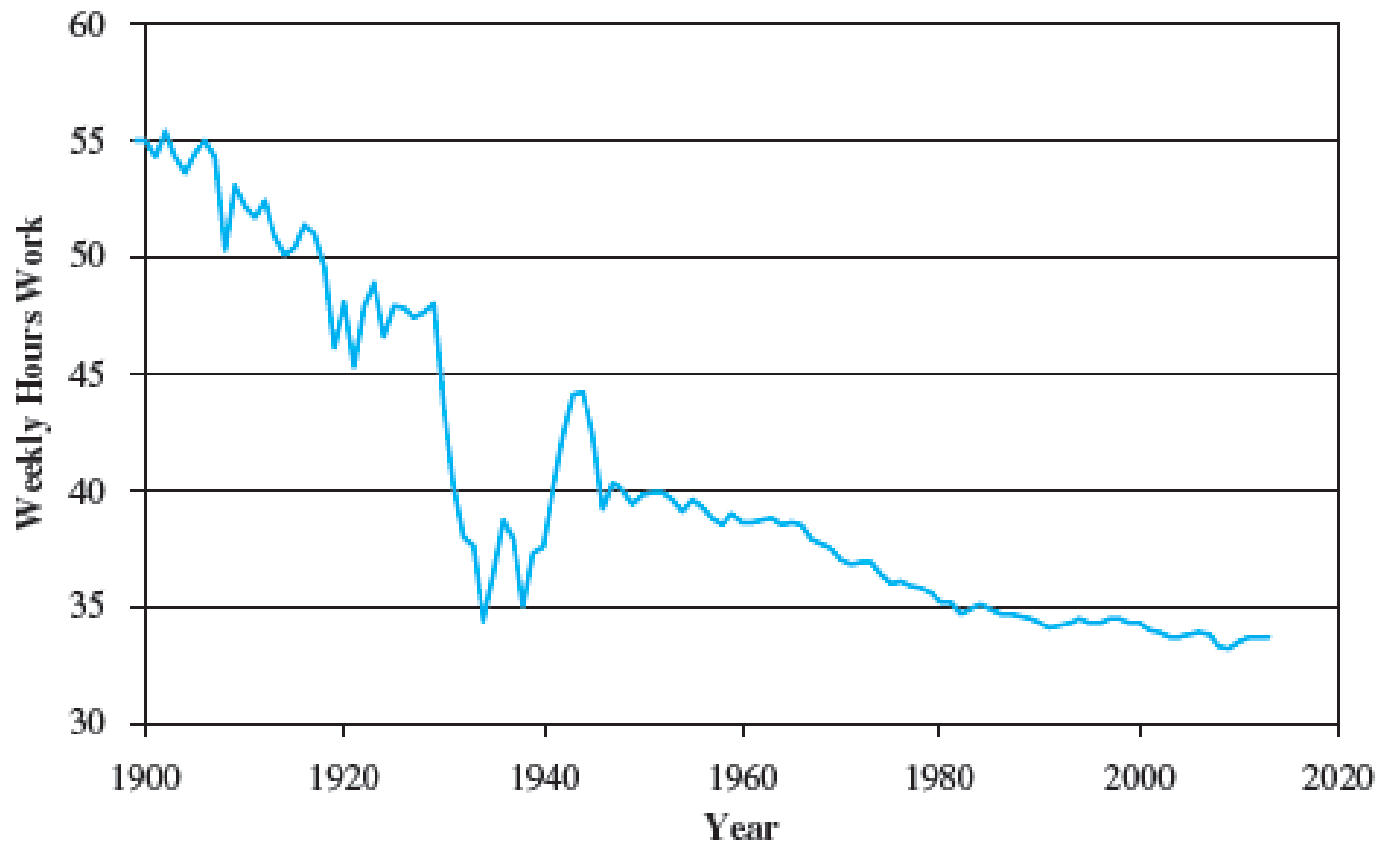
Neo-Classical Model of Labor-Leisure Choice

□ Questions: work or not? <u>How many hours to work?</u>

□ Utility Function

  ▫ Measure of satisfaction individuals receive from consumption (C) of goods and leisure (L).

  ▫ U = f(C, L)

    ▪ U is an index, called <u>utility</u>.

    ▪ More consumption goods, more hours of leisure → happier (higher utility)

    ▪ The higher is U, the happier is the person.

Indifference Curves

- Definition: different combinations of consumption goods and hours of leisure yield the same level of utility.

- Characteristics of indifference curves
  - Downward sloping, indicating the tradeoff between consumption and leisure.

  - Higher curves = higher utility.

  - Do not intersect.

  - Convex to the origin

Indifference Curves
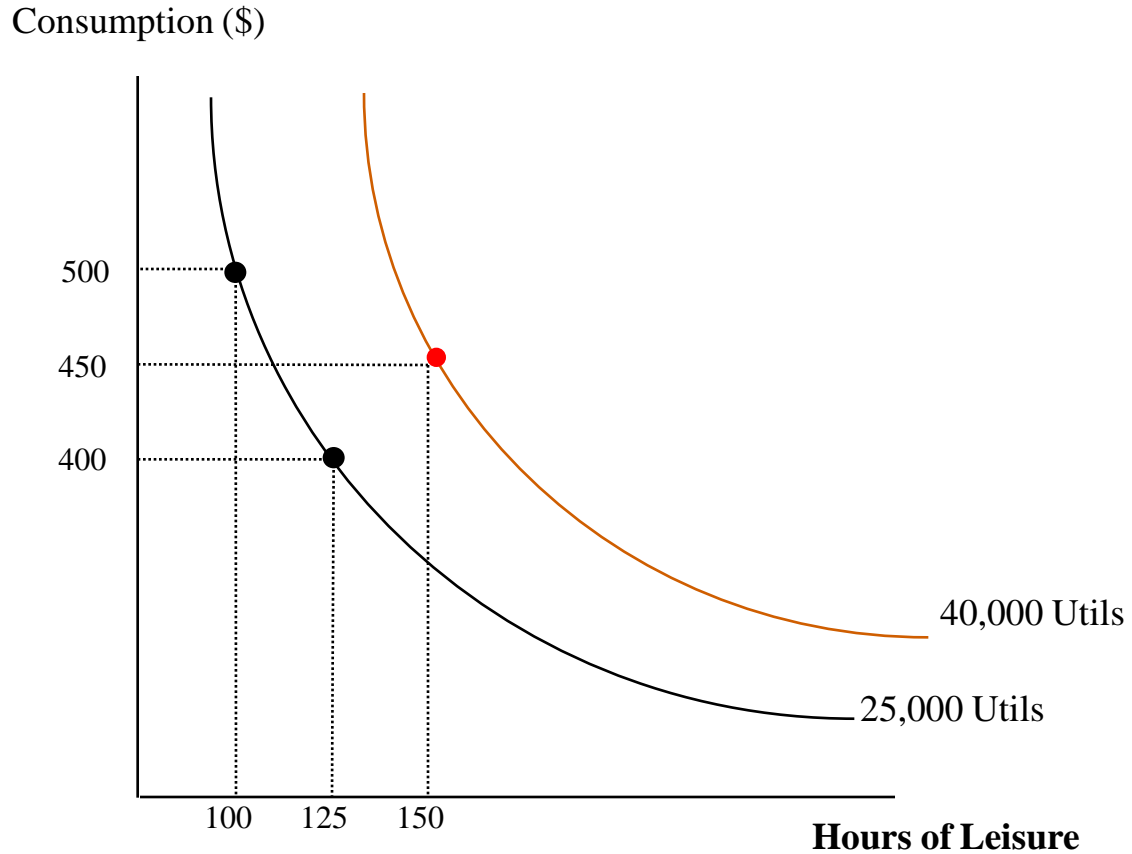
Indifference curves

- Marginal utility
  - The change in utility resulting from an additional unit of consumption or additional hour of leisure
  - Mathematically, it is <u>partial derivative</u> of utility function with respect to consumption/leisure
  - Marginal utility of consumption goods: MU_c
  - Marginal utility of leisure: MU_L
- Slope of indifference curve
  - Econ intuition: How much consumption am I prepared to give up for another hour of leisure, <u>while holding utility constant</u>?
  - $\Delta C / \Delta L$

Indifference curves

□ Relation between slope of indifference curve and marginal utilities

  ▫ $\Delta C/\Delta L = - MU_L/MU_C$

  ▫ The absolute value of the slope of an indifference curve, which is also called the MRS, is the ratio of marginal utilities.

    ▪ $MRS = |\Delta C/\Delta L| = MU_L/MU_C$

  ▫ Convexity → diminishing marginal rate of substitution

□ MRS= | $\Delta C/\Delta L$ |= MU_L/MU_c

- ◻ the rate at which a consumer is ready to give up one good in exchange for another good while maintaining <u>the same level of utility</u>.

- ◻ How many units of consumption you are willing to give up in order to get one additional hour of leisure, <u>holding utility level constant</u>.

- ◻ Marginal rate of substitution is diminishing (convexity of indifference curve)

- ◻ Bigger MRS→ steeper of the slope→ to get additional one hour of leisure, you are willing to give up more consumption → prefer leisure

  - ▪ MRS=2 v.s. MRS=1

□ In-class problem 2: MU & MRS

Compare Preferences

Consumption ($)

Consumption ($)

U_1

U_0

Hours of Leisure

U_1

U_0

Hours of Leisure
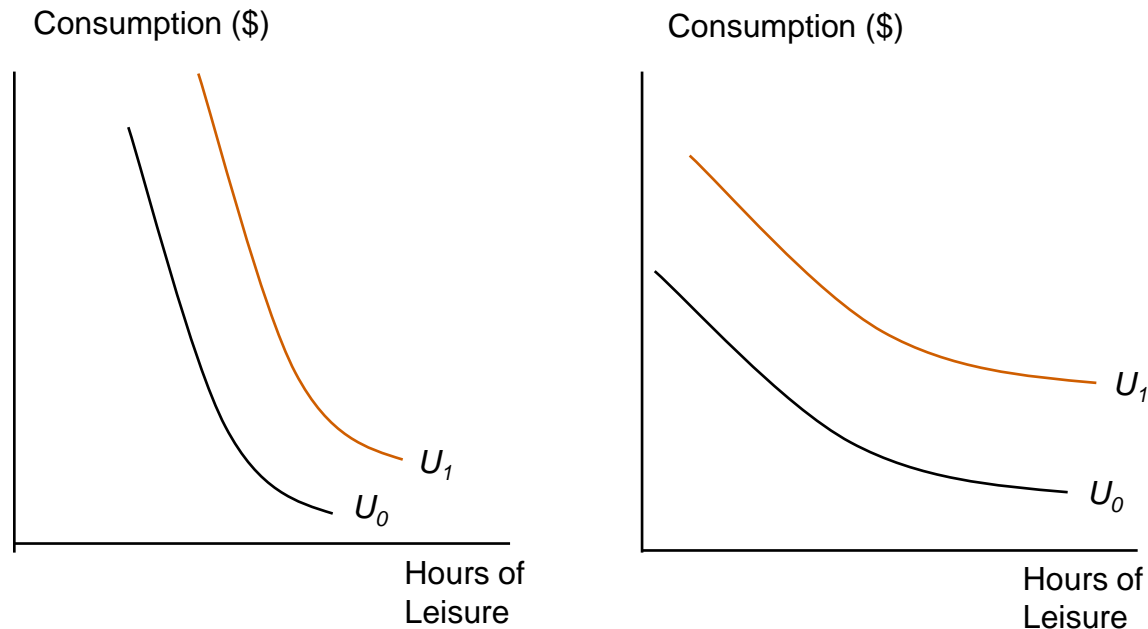
Workers with <u>steeper</u> indifference curves value their <u>leisure</u> relatively more than workers with shallower indifference curves.

Indifference curve steeper→ MRS bigger→ prefer leisure

In-class problem 3: indifference curves

The Budget Constraint

- The budget constraint defines the worker's opportunity set, indicating all of the consumption – leisure combinations the worker can afford.

- $C = wh + V$

  - w: wages; h: hours of work; V: nonlabor income; T: total hours available
  - Consumption equals labor earning (wages × hours of work) plus nonlabor income (V).
  - As $h = T - L$, can rewrite $C = w(T - L) + V$.

Graphing the Budget Constraint

Consumption ($)

$wT+V$

Budget Line

V .... E : endownment point

Hours of Leisure

0 T
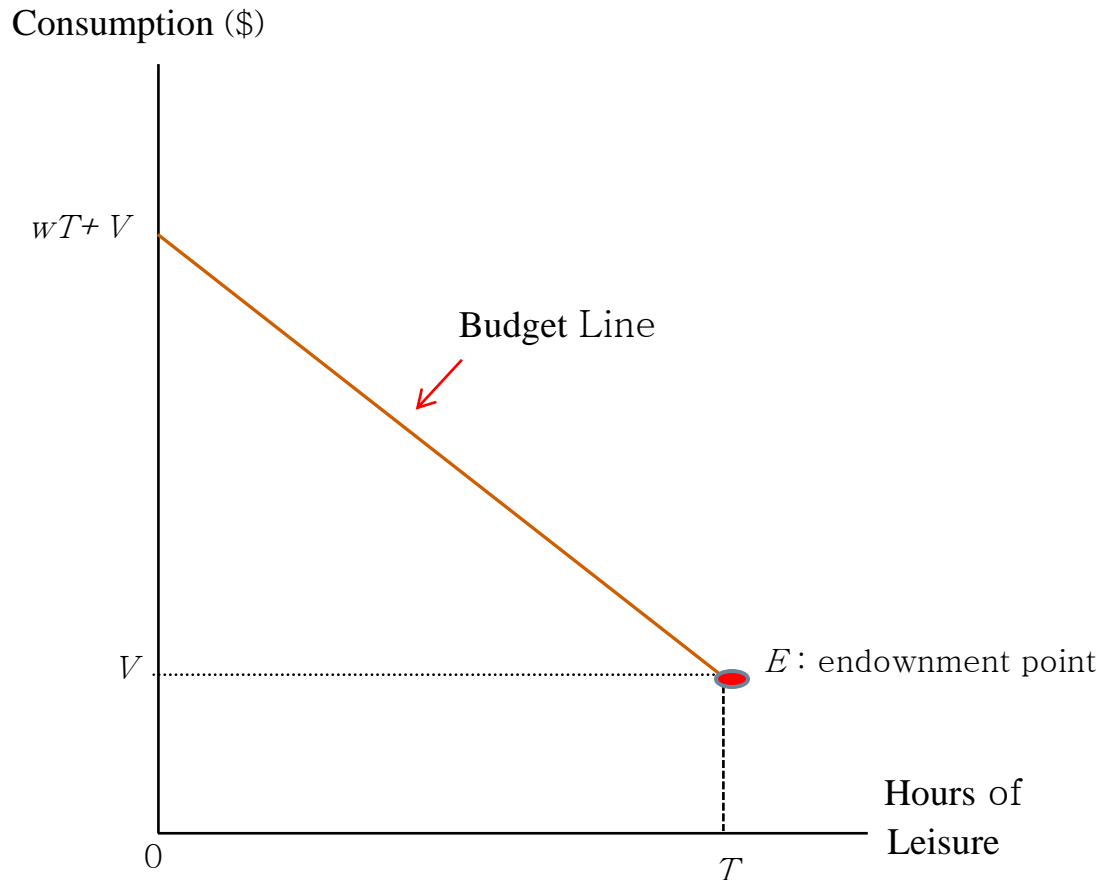
In-class problem 4: budget constraint

# Short summary

- Question: if the worker enters the labor force, how many hours does he work?
- Terms:
  - Utility function; C, L;
  - Indifference curve
  - MRS
  - Marginal utilities
  - Budget constraint→ budget line
- Next, combine them into models

The Hours of Work Decision

□ Individuals choose consumption and leisure to maximize utility subject to budget constraints.

□ Optimal consumption is given by the point where the budget line is tangent to the indifference curve.

  ▪ At this point the marginal rate of substitution (MRS) between consumption and leisure equals the wage.

  ▪ Any other consumption – leisure bundle on the budget constraint would give the individual less utility.
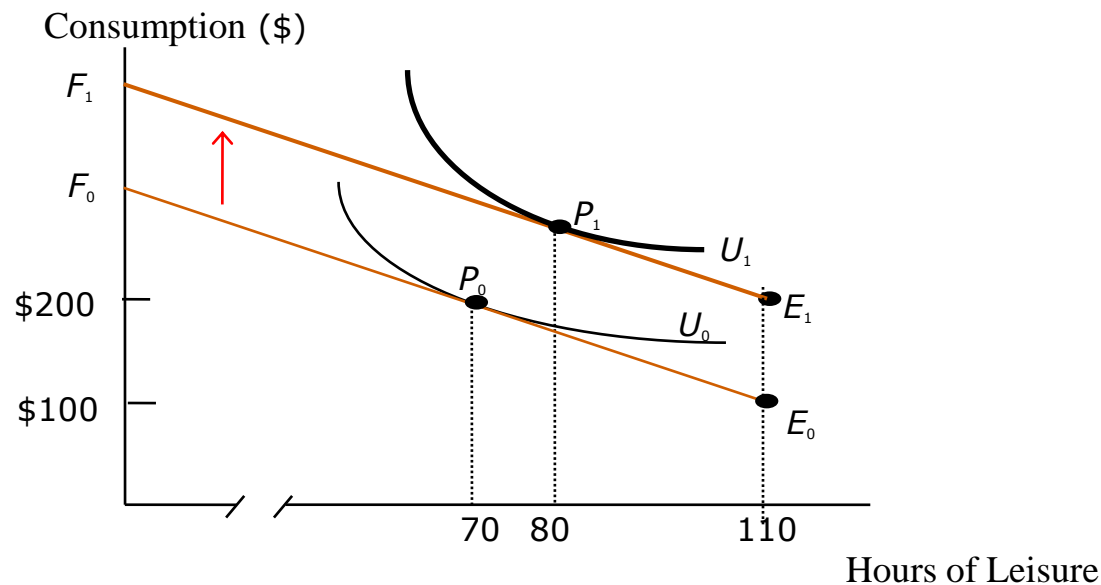
Optimal Consumption and Leisure

18
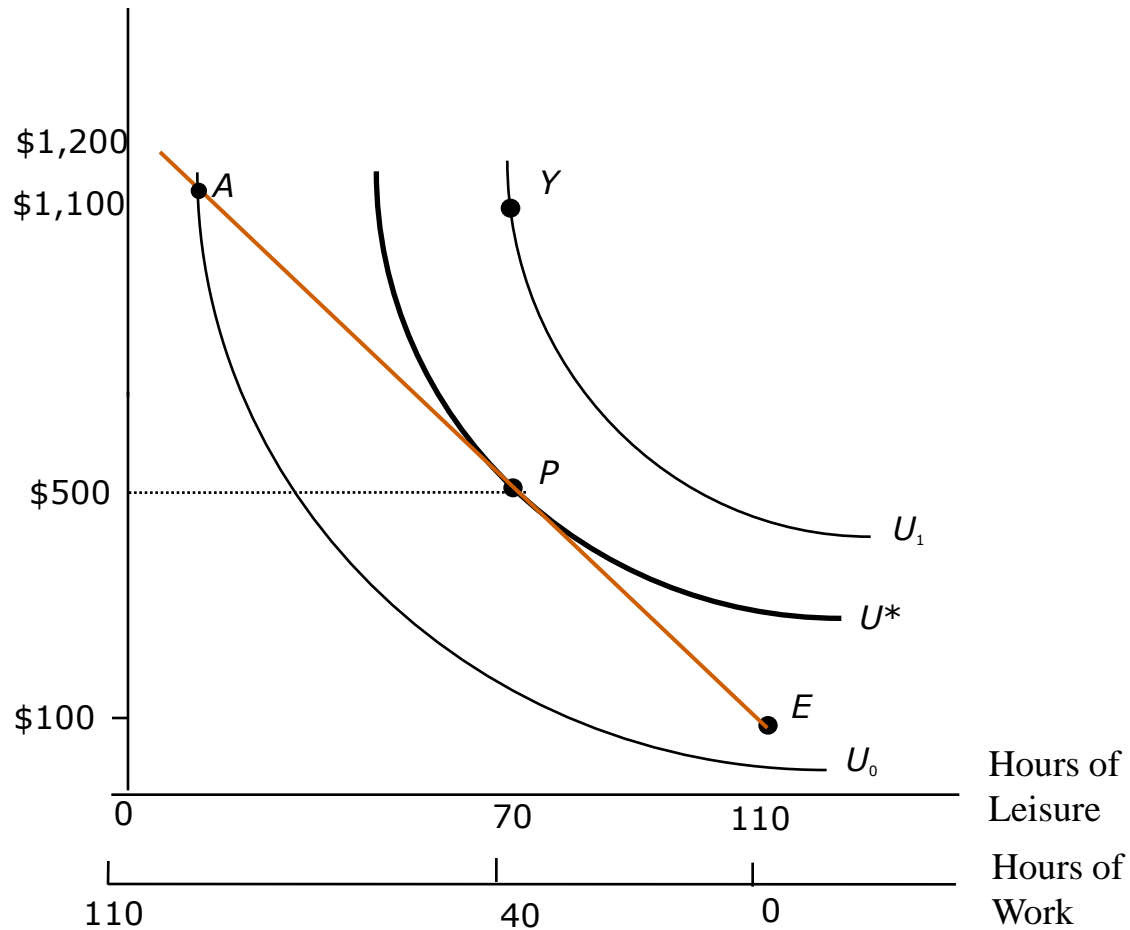
- An interior solution to the labor-leisure decision: point P
- **Tangency condition**
  - $MRS = MU_L/MU_C = w$
 - At the chosen level of consumption and leisure, the MRS equals the wage rate (wage per hour).

□ In-class problem 5: labor-leisure decision

The Effect of a Change in Nonlabor Income on Hours of Work

An increase in nonlabor income leads to a parallel, upward shift in the budget line, moving the worker from point P_0 to point P_1. If leisure is a normal good, hours of work fall.

The Effect of a Change in Nonlabor Income on Hours of Work
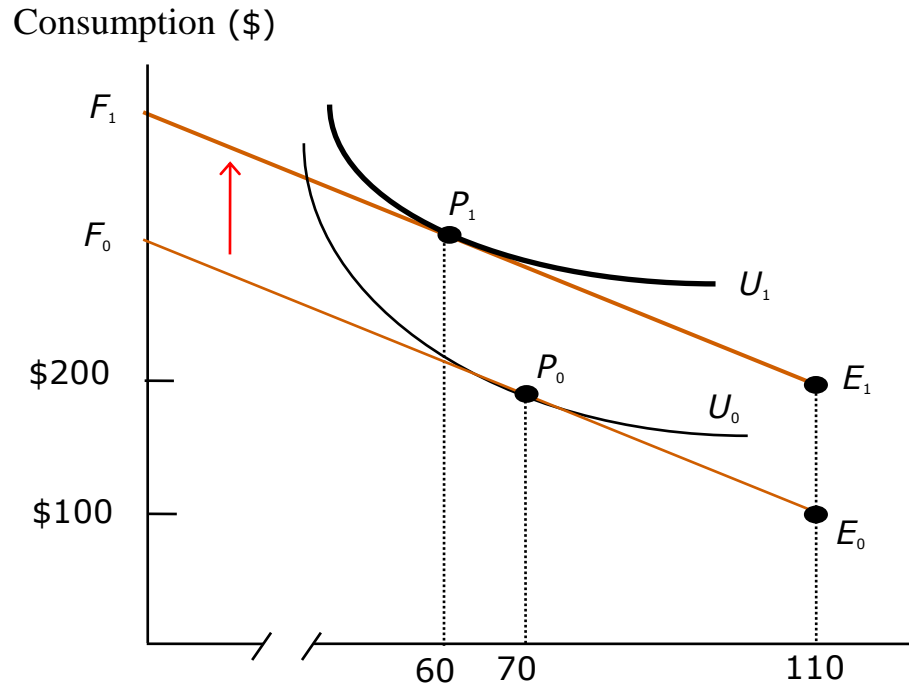
An increase in nonlabor income leads to a parallel, upward shift in the budget line, moving the worker from point P_0 to point P_1. If leisure is inferior good, hours of work increase.

The Effect of a Change in Nonlabor Income on Hours of Work

- Summary:
  - The impact of the change in nonlabor income (holding wages constant) on the number of hours worked is called <u>income effect</u>.
  - If leisure is normal good, increase in V→ leisure increases→ hours of working decrease
  - If leisure is inferior good, increase in V→ leisure decreases→ hours of working increases

The effect of a change in wage

- Consider an increase in w:
  - How will hours of leisure change? increase or decrease?
  - Change in wage rotates budget line around the endowment point.
  - Income effect
    - The change in optimal combination due to change in income, holding wage constant.
  - Substitution effect
    - The change in optimal combination due to change in relative prices (wage), holding utility constant.
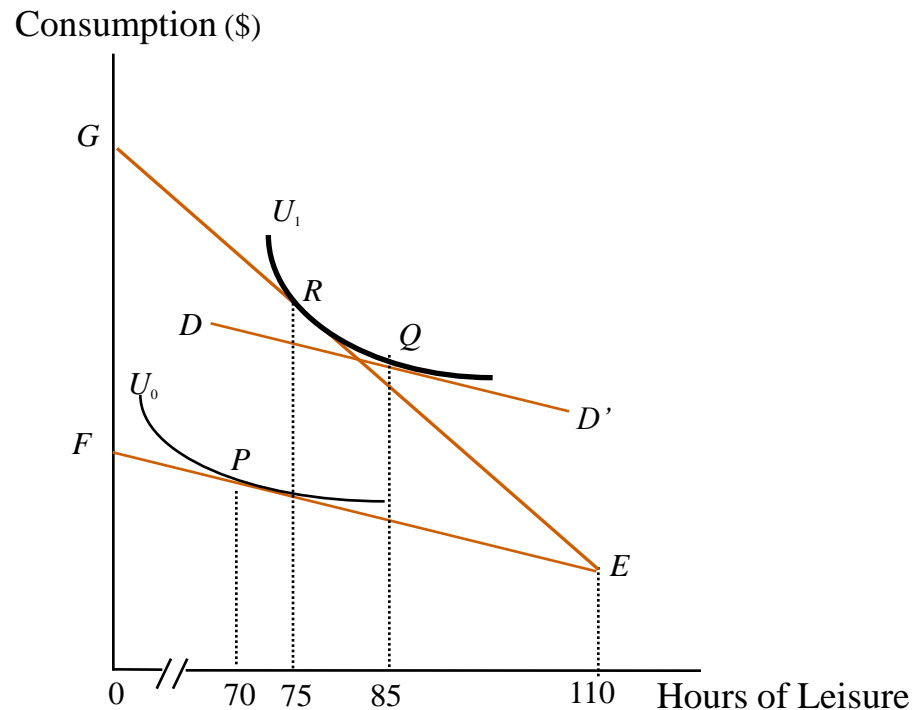
The effect of a change in wage

- Income effect
  - Income increases$\rightarrow$ C increases, L increases$\rightarrow$ hours of working decreases

- Substitution effect
  - Opportunity cost of leisure increases (leisure is more expensive)$\rightarrow$ C increases, L decreases$\rightarrow$ hours of working increases

The effect of a change in wage

**More Leisure/less work at a Higher Wage (IE > SE)**

When the income effect dominates the substitution effect, the worker increases hours of leisure in response to an increase in the wage.

21

The effect of a change in wage

Less leisure/more work at a Higher Wage (IE < SE)

When the substitution effect dominates the income effect, the worker decreases hours of leisure in response to an increase in the wage.
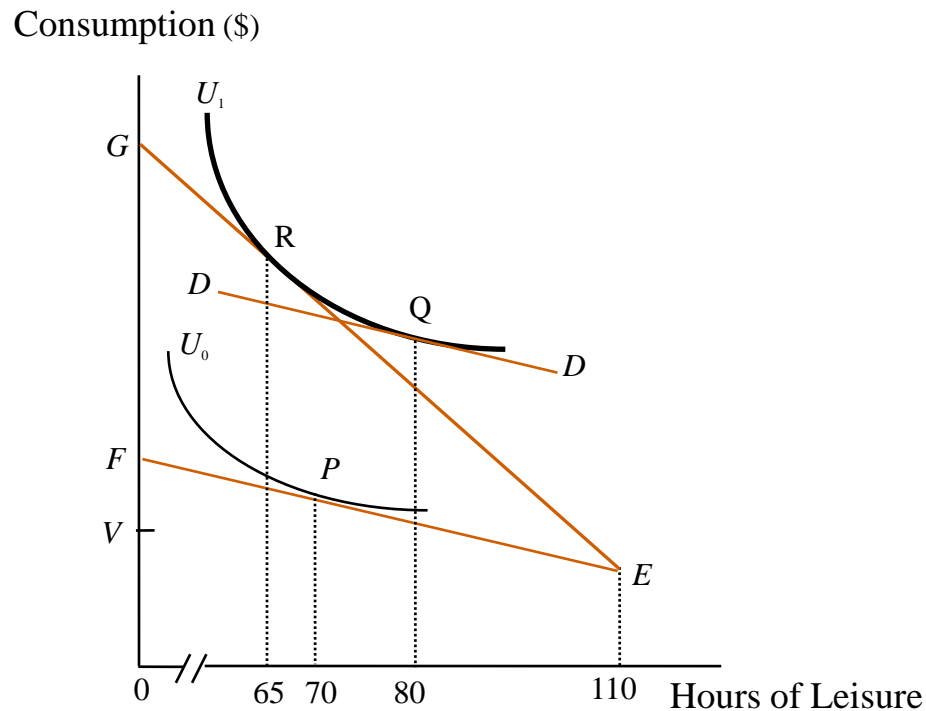
NEXT...

- Decision of how many hours to work
- Decision of whether work or not
  - Reservation wage

To Work or Not to Work?

- What factors motivate a person to enter the labor force in the first place?

- Are the wages higher enough to bribe worker into entering the labor market?

- <u>Reservation wage</u>: the lowest wage rate that would make the person indifferent between working and not working.

  - Rule 1: if the market wage is less than the reservation wage, then the person will not work.

  - Rule 2: the reservation wage increases as nonlabor income increases

The Reservation Wage
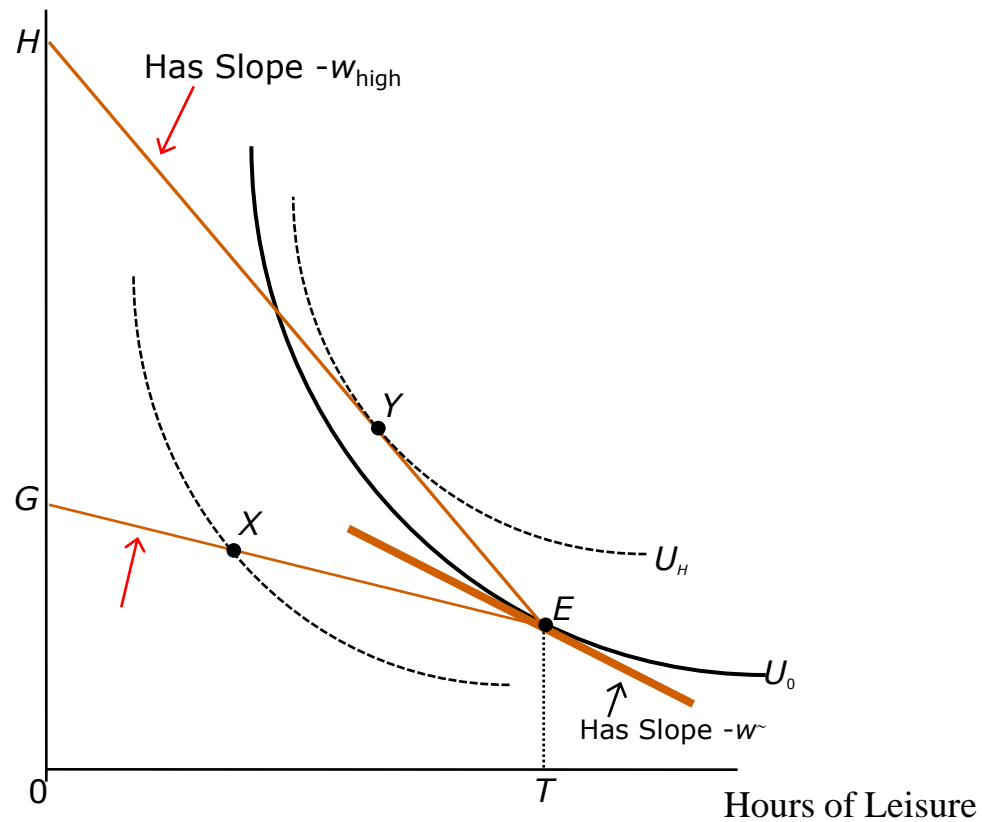
□ In-class problem 6: reservation wage

Labor Supply Curve

☐ Relationship between hours worked and the wage rate.

▫ At wages slightly above the reservation wage, the labor supply curve is positively sloped (the substitution effect dominates the income effect).

▫ If the income effect begins to dominate the substitution, hours of work decline as the wage rate increases (a negatively sloped labor supply curve).

The Backward Bending Labor Supply Curve
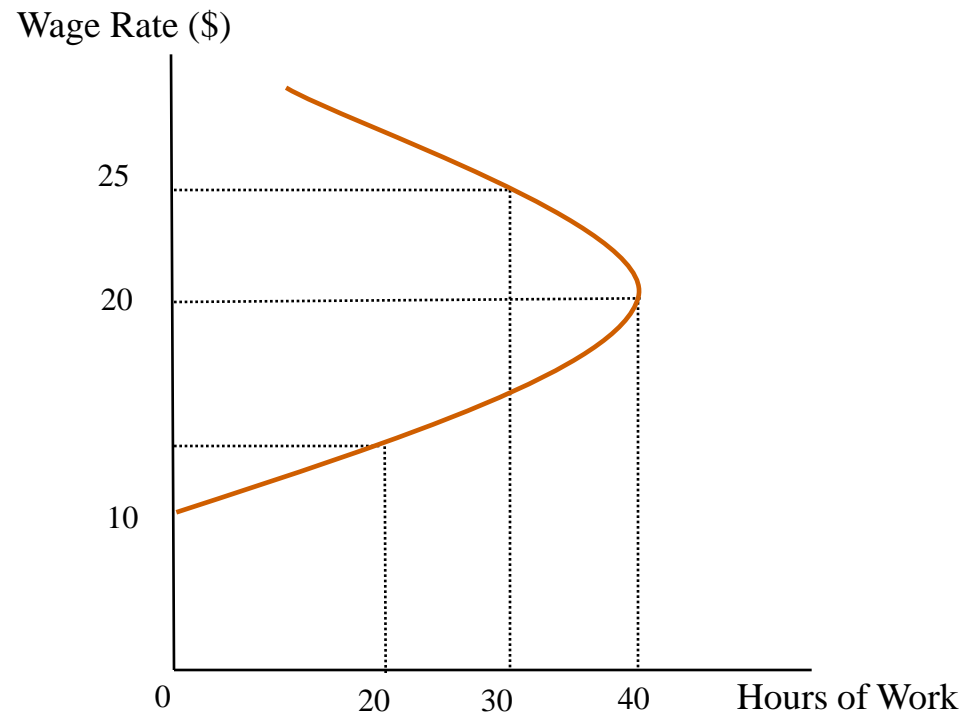
Labor Supply Elasticity

- The labor supply elasticity (σ) measures responsiveness in hours worked to changes in the wage rate.
  - σ = Percent change in hours worked divided by the percent change in wage rate.
  - Labor supply elasticity less than 1 is **<u>inelastic</u>** as hours of work respond proportionally less than the change in wages.
  - Labor supply elasticity greater than 1 is **<u>elastic</u>** as hours of work respond proportionally more than the change in wages.
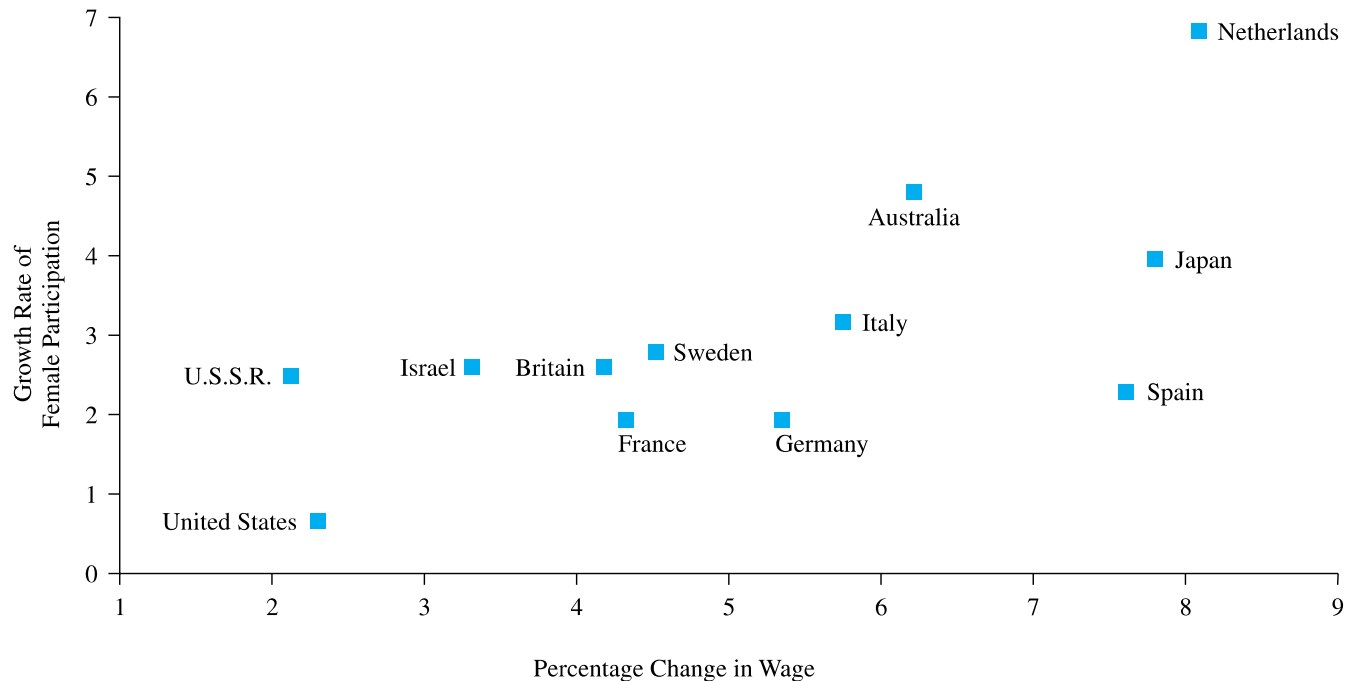
☐ In-class problem 7: labor supply elasticity

Labor Supply of Women

□ Over time, women's participation rates have increased.

□ In most studies on female labor supply, the substitution effect dominates the income effect for women, implying an upward sloped labor supply curve.

Growth in Female Labor Force Participation Rates and the Wage Cross Countries, 1960-1980

- Source: Jacob Mincer, "Intercountry Comparisons of Labor Force Trends and of Related Developments: An Overview," *Journal of Labor Economics* 3 (January 1985, Part 2): S2, S6.

Labor supply of women

□ Reasons for women's increase in labor force participation
  - ◻ Changes in wage rate
  - ◻ Decreases in fertility rate
  - ◻ Technological advances

Policy Application: Welfare Programs and Work Incentives

☐ Welfare reduces supply of labor by increasing nonlabor income, which raises the reservation wage.

☐ <u>Cash grants</u> reduce wage incentives.

Effect of a Cash Grant on Work Incentives

A take-it-or-leave-it cash grant of $500 per week moves the worker from point *P* to point *G*, and encourages the worker to leave the labor force.
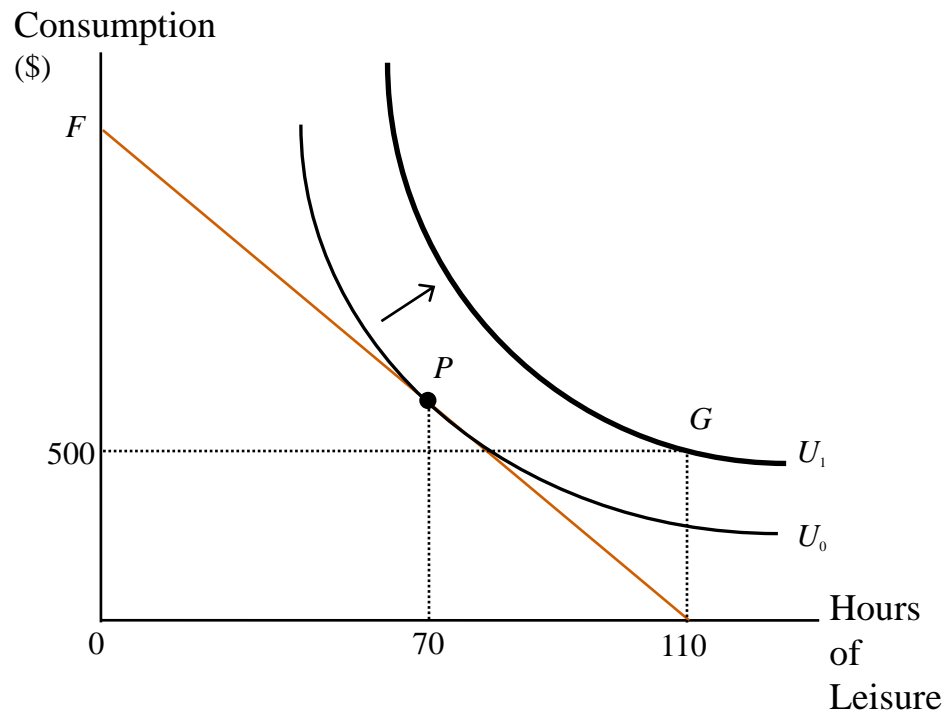
- <u>Welfare programs</u> create work disincentives.
- Government takes away 50 cents from the cash grant for every dollar earned in the labor market.

Effect of a Welfare Program on Hours of Work