

## Chapter 2

# Labour Supply

McGraw-Hill/Irwin  
Labor Economics, 4<sup>th</sup> edition

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## Introduction to Labour Supply

- This chapter: The static theory of labour supply (LS), i.e. how workers allocate their time at a point in time, plus some extensions beyond the static model (labour supply over the life cycle; household fertility decisions).
- The **‘neoclassical model of labour-leisure choice’**.
  - Basic idea: Individuals seek to maximise well-being by consuming both goods and leisure. Most people have to work to earn money to buy goods. Therefore, there is a trade-off between hours worked and leisure.

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## 2.1 Measuring the Labour Force

- The US definitions in this section are similar to those in NZ.
  - However, you have to know the NZ definitions (see, for example, **chapter 14 of the New Zealand Official Yearbook 2008**, and the **explanatory notes in Labour Market Statistics 2008**, which were both handed out in class).
- **Labour Force (LF) = Employed (E) + Unemployed (U).**
  - Any person in the working-age population who is neither employed nor unemployed is “not in the labour force”.
  - Who counts as ‘employed’? Size of LF does not tell us about “intensity” of work (hours worked) because someone working ONE hour per week counts as employed.
  - Full-time workers are those working 30 hours or more per week.

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## Measuring the Labour Force

- **Labor Force Participation Rate:  $LFPR = LF/P$** 
  - Fraction of the working-age population P that is in the labour force.
  - P = The usually resident, non-institutionalized, civilian population of NZ, aged 15 years and over.  
 $P = E + U + \text{'not in labour force'}$   
*(an overhead showing NZ data for P was shown in class)*
- **Employment Rate:** Employment / Population (percent of working-age population that is employed):  $EPR = E/P$
- **Unemployment Rate:  $UR = U/LF$**

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## Measuring the Labour Force

- Labour force measurement is likely to understate the effects of a recession because it excludes the 'hidden unemployed' from the unemployment rate.
- The hidden unemployed: Persons who have left the labour force and giving up in their search for work ('discouraged workers'). They are not counted as unemployed but maybe should (i.e. they would really like to work and start looking for work again once the economy picks up).
- Some argue that the Employment Rate might be a better measure of fluctuations in economic activity than the UR. This is controversial because it would include many people who really do not seek work (see p. 23).

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## 2.2 Basic Facts about Labour Supply

- Some long-run US labour facts (NZ trends are similar):
  - Decline in labour force participation of working men over time.
  - Rise in labour force participation of working women over time.
  - Work hours fell over time.
- For some NZ labour data, see:
  - *NZ Official Yearbook 2008*: chapter 14, Tables 14.04, 14.05, 14.06.
  - Statistics NZ, *Labour Market Statistics 2008*: Especially chapters 2, 3 & 8 ('Working-age population'; 'labour force', 'hours of work'). Some tables from chapter 2 were shown in class: Tables 2.01, 2.02, part of Table 2.04, as well as Table 8.01 from chapter 8.

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## 2.3 The Worker's Preferences

- The framework used to analyse labour supply behaviour is the Neoclassical Model of Labour-Leisure Choice, i.e. 'standard micro-economics'.
- **Utility Function 'U'** – measure of satisfaction that individuals receive from consumption of goods C and leisure L (a kind of good). C measured as \$ value of all goods purchased during a period. L is the number of leisure hours during the same period.
- $U = f(C, L)$ , where U is an index and a higher U means higher utility/satisfaction/happiness/well-being. U is a **utility function** in general form.
- U higher if C and/or L or both higher. C and L are 'goods', not 'bads'. DO THESE ASSUMPTIONS MAKE SENSE?

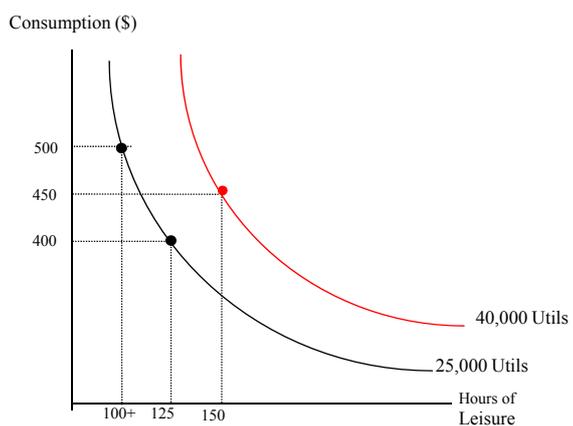
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## Indifference Curves

- **Indifference Curve: The locus of all points (i.e. combinations) in C, L space that give the same level of utility.**
- Each level of utility lies on a different indifference curve. Higher curves = higher utility (& vice versa). Each individual has a 'map' of indifference curves.
- Downward sloping (indicates the trade-off between consumption and leisure): If more of one, you need less of the other to hold U constant.
- Indifference curves do not intersect.
- Convex to the origin (indicating that opportunity costs increase). For example, the fewer leisure hours there are, the more C the person has to gain in order to give up another hour of leisure and keep U constant.

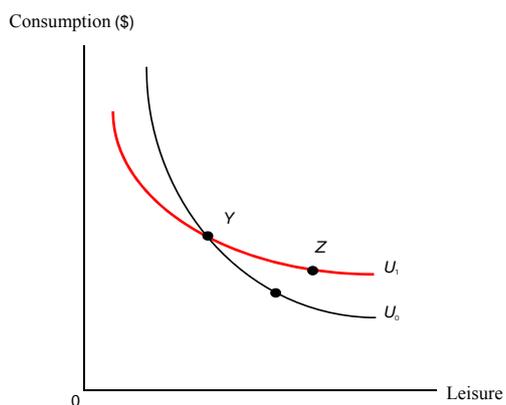
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**Figure 2-2: Indifference Curves**



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**Figure 2-3: Indifference Curves Do Not Intersect**



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## The Slope of an Indifference Curve

- The change in utility resulting from an additional \$ spent on goods, holding constant the number of leisure hours, is the **Marginal Utility of Consumption:  $MU_C$**
- The change in utility resulting from one more hour of leisure, holding constant the amount of goods consumed, is the **Marginal Utility of Leisure:  $MU_L$**
- They are both positive numbers.
- The absolute value of the slope of an indifference curve is the **Marginal Rate of Substitution (MRS) in Consumption:**

$$(2.6) \quad \frac{\Delta C}{\Delta L} = - \frac{MU_L}{MU_C}$$

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## The Slope of an Indifference Curve

- Equation (2.6) can also be derived as follows (see footnote 7, p. 30): Going from right to left along a particular indifference curve in Figure 2-2 (e.g. reduce leisure hours by 1 hour) results in:

$$\text{Utility loss} = \Delta L * MU_L; \quad \text{Utility gain} = \Delta C * MU_C$$

The person remains on the same indifference curve, i.e. utility loss = utility gain:

$$(\Delta L * MU_L) + (\Delta C * MU_C) = 0$$

Rearranging gives eq. (2.6).

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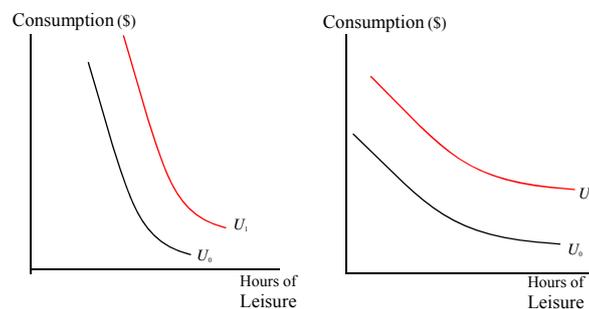
## The Slope of an Indifference Curve

- Convexity implies that the slope of an indifference curve is steeper when the worker is consuming a lot of goods and little leisure, and flatter when the worker is consuming few goods and a lot of leisure. It shows the utility trade-off between C & L, while holding U constant.
- This means that the absolute value of the slope of an indifference curve declines as the worker moves down the curve (i.e. from left to right).
- Convexity is equivalent to assuming diminishing marginal rate of substitution.

2-14

## Figure 2-4: Differences in Preferences across Workers

Steep and flat indifference curves (a: leisure valued highly; b: leisure valued lowly):



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## Differences in Preferences across Workers

- Interpersonal differences in the ‘taste for work’ are often neglected in standard labour economics (see comments p. 31), and only a ‘representative agent’ is used.
- Are tastes really too difficult to measure? What about psychology?

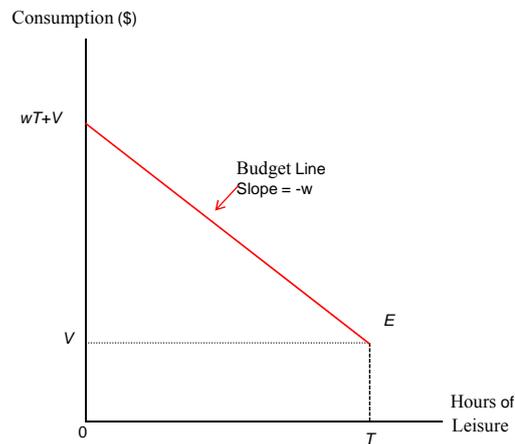
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## 2.4 The Budget Constraint

- A person’s consumption of C & L is constrained by her time and income.
- Expenditure on goods C equals labour earning (wage rate  $\times$  hours) plus nonlabour income (V):  $C = wh + V$ . This is the worker’s **budget constraint**.  
 There are no savings in this simple model. Also assume a constant wage rate (wage independent of hours worked).
- Total time available (e.g. per week) T equals  $h + L$ . Because of this, rewrite the budget constraint as  $C = w(T - L) + V$  or  $C = (wT + V) - wL$ .
- Draw this equation in C, L space to obtain the **budget line**.

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## Figure 2-5: Depicting the Budget Constraint



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## The Budget Constraint

- The budget line delineates the frontier of the worker's **opportunity set** of all the consumption baskets s/he can afford to buy.
- Figure 2-5:
  - **E = Endowment point** (all leisure, but still some C due to nonlabour income);
  - **slope =  $-w$** ;
  - intercept gives maximum possible consumption of goods (& no leisure at all).
- Moving to the left along budget line: Each hour of leisure given up allows the worker to buy more goods.

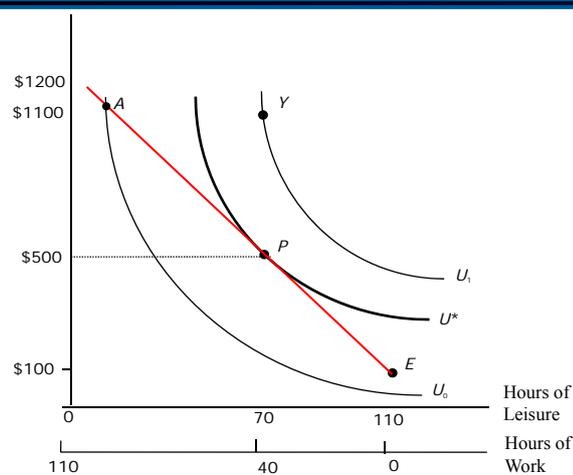
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## 2.5 The Hours of Work Decision

- A person will choose C & L to maximise utility. Let's put her indifference curves and her budget line into one diagram.
- Optimal consumption is given by the point where the budget line is tangent to the indifference curve (point P in Figure 2-6). It is an *interior solution* (i.e. the person doesn't either work all hours or none).
- Any other bundle of C & L, given the budget constraint, would mean the person has less utility (see point A in Figure 2-6; point Y is not affordable).

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**Figure 2-6: Optimal Consumption and Leisure**



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## Interpreting the Tangency Condition

- At the optimal (utility-maximising) point P, the slope of the indifference curve is the same as that of the budget line. This is the same as saying that the MRS in consumption equals the wage rate:

$$(-) MU_L / MU_C = (-) w \quad (2.9)$$

- To understand this better, re-write as:  $MU_L / w = MU_C$  (2.10)
  - $MU_L$  is the additional utility received from consuming an extra hour of leisure. This extra hour costs \$w.  $MU_L / w$  gives the number of 'utils' received from spending an extra \$ on leisure. C already defined in \$s, i.e.  $MU_C$  gives extra utils from spending an extra \$ on C.

**In short, equation (2.9) implies that the last \$ spent on L buys the same number of 'utils' as the last \$ spent on C.**

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## Two Effects: What Happens to Hours of Work When (a) Nonlabour Income and (b) the Wage Changes?

### Case 1: Increase in nonlabour income V, holding the wage constant (Figure 2-7)

- Constant wage implies an unchanged slope of the budget line.
- Initially:  $V = \$100$  and endowment point  $E_0$ . Optimal point  $P_0$ .
- Now:  $V = \$200$  and endowment point  $E_1$ . The budget line has shifted up.
- This allows the worker to jump to a higher indifference curve. New optimal point  $P_1$ . Opportunity set has increased.
- The impact of the change in nonlabour income (holding wages constant) on the number of hours worked is called an income effect.**

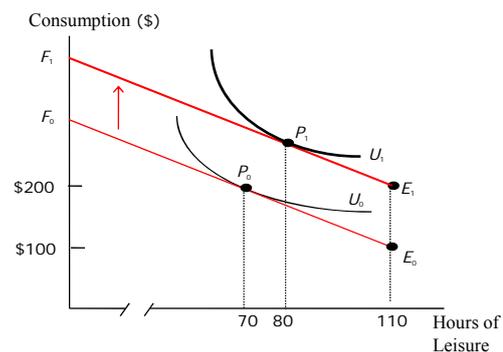
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## Case 1 continued

- Whether more of both C&L, or only more of one (and less of the other) is consumed depends on the nature of the two goods.
- “A good is a **normal good** when increases in income, holding the prices of all goods constant, increase its consumption.”
- “A good is an **inferior good** when increases in income, holding prices constant, decrease its consumption.”
- Leisure could be a normal good or an inferior good (see FIGURES 2-7a/b). It is usually assumed to be a normal good, i.e. the income effect due to an increase in V reduces hours of work (assuming a constant wage).

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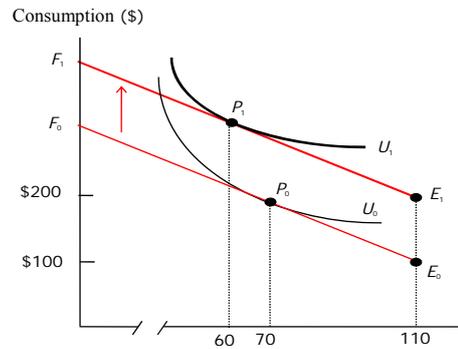
**Figure 2-7a: The Effect of a Change in Nonlabour Income on Hours of Work**



An increase in nonlabour income leads to a parallel, upward shift in the budget line, moving the worker from point P<sub>0</sub> to point P<sub>1</sub>. If leisure is a normal good, hours of work fall.

2-25

### Figure 2-7b: The Effect of a Change in Nonlabour Income on Hours of Work



An increase in nonlabour 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 an inferior good, hours of work increase.

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### Case 2: Increase in the wage rate, holding $V$ constant (Figures 2-8, 2-9)

- Endowment point unchanged, but budget line rotates upwards. The worker's opportunity set has increased.
- Worker ends up on a higher indifference curve. Optimal point shifted from  $P$  to  $R$ .
- **Effect on hours worked? Depends on preferences!**
  - a) **Higher income** means the worker would like to **consume more leisure** (we assume it is a normal good).
  - b) The **opportunity cost (i.e. the price) of leisure has gone up** (one extra hour of leisure now requires a higher sacrifice in terms of income forgone), thereby **reducing demand for it**.

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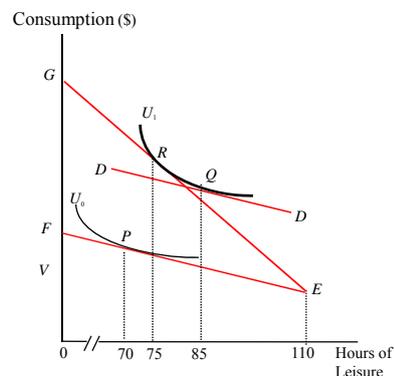
## Case 2 continued

- Think of the move from old to new optimal point as a two-stage process:
  - 1. Wage and income  $\uparrow$  (**Income Effect**): To isolate this effect, draw a new budget line that is parallel to the old budget line (same slope), but that is tangent to the new indifference curve. **Move from P to Q: hours of work  $\downarrow$ .**
  - 2. Leisure relative more expensive: **Substitution Effect** (indicates what happens to the worker's consumption bundle as the wage increases, holding utility constant). **Move from Q to R: hours of work  $\uparrow$ .**
- If the Income Effect is greater than the Substitution Effect, then hours of work decrease (hours of leisure increase) when the wage rate rises.
- If the Substitution Effect is greater than the Income Effect, then hours of work increase (hours of leisure decrease) when the wage rate rises.

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## Figure 2-9a: More Leisure at a Higher Wage

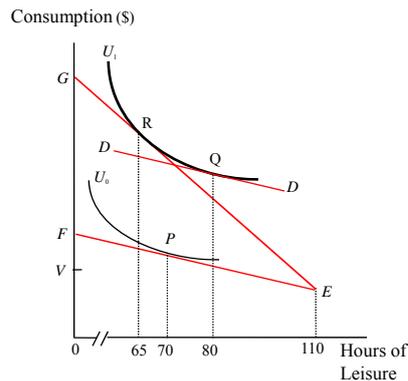
- When the Income Effect dominates:



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## Figure 2-9b: More Work at a Higher Wage

- When the Substitution Effect dominates:



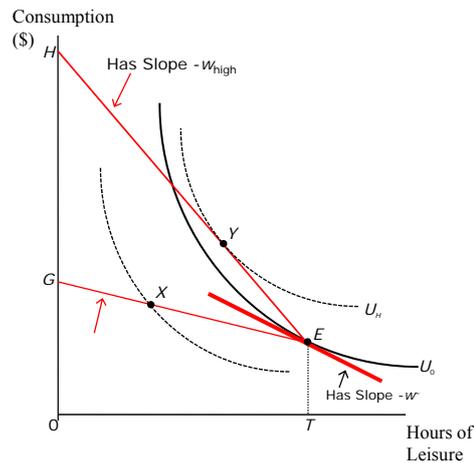
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## 2.6 To Work or Not to Work?

- What factors determine whether somebody enters the labour force in the first place? Are the “terms of trade” sufficiently attractive to bribe a worker to enter the labour market?
- **Reservation wage:** The minimum increase in income that makes a person indifferent between working and not working. The higher it is, the less likely a person will work.
- **Work/don't work decision:** Figure 2-10. **Compare slope of the indifference curve that goes through the endowment point E with the slope of the budget line, i.e. the wage! Where they are the same, we have the reservation wage.**
  - If the market wage ('what employers offer') is less than the reservation wage ('how much the worker requires'), the person will not work (& vice versa).
  - If leisure is a normal good, the reservation wage increases as non-labour income increases (& vice versa). (See what happens to slope of indifference curves at E as E rises!)

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## Figure 2-10: The Reservation Wage



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## 2.7 The Labour Supply Curve

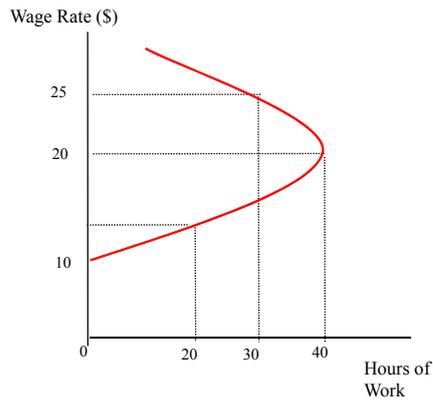
- The **labour supply curve** is the relationship between hours worked and the wage rate.
  - At wages slightly above the reservation wage, the labour supply curve is positively sloped (the substitution effect dominates).
  - If the income effect begins to dominate, hours of work decline as wage rates increase (a negatively sloped labor supply curve). **See Figure 2-11a/b, p. 44!**
- **Labour supply elasticity:**
  - % change in hours worked / % change in wage rate!  

$$\sigma = (\Delta h/h)/(\Delta w/w) = (\Delta h/\Delta w)(w/h) \quad (2-11)$$
  - Can be positive (substitution effect dominates) or negative (income effect dominates).
  - Labour supply elasticity less than 1 in absolute value means “inelastic” (greater than 1 means ‘elastic’) labour supply.

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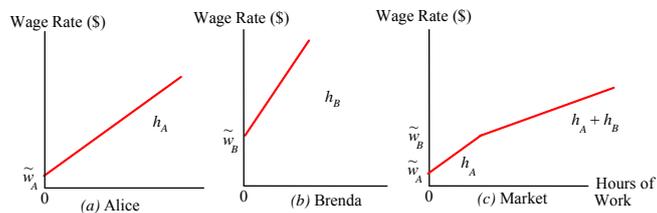
## Figure 2-11b: Labour Supply Curve

- Example of backward bending labour supply:



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## Figure 2-12: Derivation of Market Labour Supply Curve from Supply Curves of Individual Workers



- Add labour supply curves of all workers horizontally.

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## 2.8 Estimates of Labour Supply Elasticity

- Lots of empirical research done on relationship between hours of work and wages. Estimated separately for males and females.
- LS elasticity estimates of men. Typical regression model:

$$h_i = \beta w_i + \gamma V_i + \text{other variables} \quad (2-13)$$

$h_i$  = Number of hours that person  $i$  works.

$w_i$  = The person's wage rate.

$V_i$  = The person's nonlabour income.

- Interpretation of  $\beta$  and  $\gamma$  estimates?

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## Estimates of Labour Supply Elasticity

- Empirical findings:
  - Almost as many estimates of the LS elasticity as there are studies!
  - **“Consensus estimate”** for male LS elasticity is **about -0.1, i.e. almost zero**. This implies:
    - It is negative, i.e. the income effect dominates.
    - Labour supply is inelastic.
    - The estimate is for ‘prime-age’ men and likely to vary a lot by age & gender.
  - Problems with the estimated elasticities (see Borjas, pp. 47-49):
    - $h_i$ ,  $w_i$ , and  $V_i$  are difficult to measure.
    - As time period increases, labour supply becomes more elastic.
    - Measurement error in hours of work tends to overemphasize the importance of the income effect.
    - Average wage usually used but we need the marginal wage.
    - ‘Selection bias’ distorts the estimates if non-workers are not included in the sample.
    - ‘Taste for work’ and nonlabour income are correlated. Etc. etc.

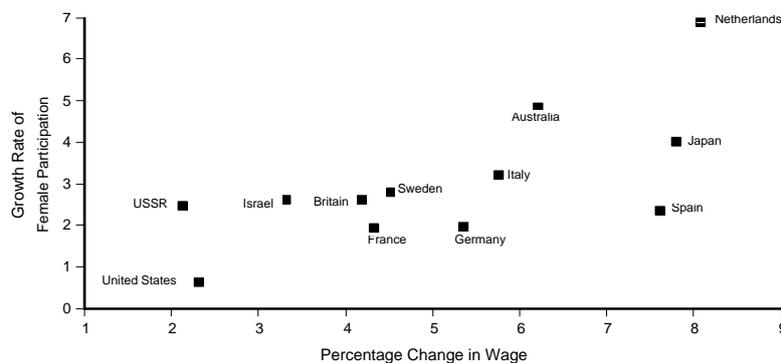
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## 2.9 Labour Supply of Women

- Substantial cross-country differences in women's labour force participation rates.
- Over time, women's participation rates have increased (for a particular age cohort over time and also for successive cohorts).
- **Increasing real wages** for women is a big explanatory factor (accounting for about 60%?). See Figure 2-13. Other factors: **Fertility** (but causation problems); **technological changes** in household production; plus lots of others.
- In contrast to studies for men, in most studies for women, substitution effects dominate income effects, resulting in a positive 'consensus' estimate of their LS elasticity! But it is not large, perhaps **0.2**.
- However, female LS decision more concerned with whether to work at all or not. Also influenced by partner's wage.

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**Figure 2-13: Cross-Country Relationship - Growth in Female Labour Force and Real Wage, 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.

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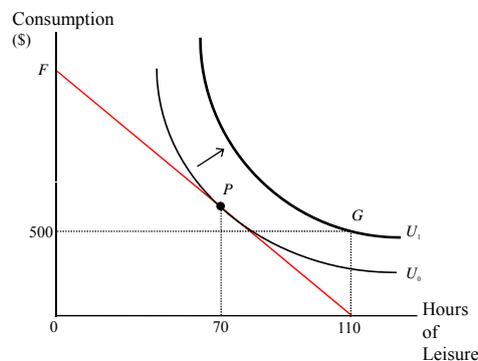
## 2.10 Policy Application: Welfare Programs and Work Incentives

- A) Cash grants and labour supply (see Figure 2-14)
  - Cash grants (nonlabour income) reduce the supply of labour, i.e. welfare programs can (and often do) reduce the incentive to work.
  - If a person would lose a cash grant completely when working, it would often be rational not to work. Note that this has nothing to do with the person having a bad work ethic!

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### Effect of a Cash Grant on Work Incentives: Figure 2-14

- 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 labour force.



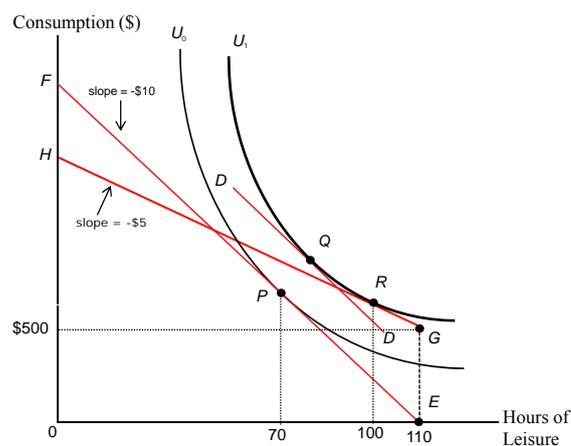
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## Welfare Programs and Work Incentives Ctd.

- B) The impact of welfare on labour supply
  - It is more common that welfare benefits reduce gradually with rising labour income.
  - Even then, it is difficult to avoid work disincentives. Many people get caught in a “*poverty trap*”, i.e. they still lose so much of the benefit when working that working doesn’t make much sense.
  - Figure 2-15: Start at point P (no welfare). Assume the wage is \$10 per hour. Then a \$500 benefit is introduced. The benefit is lost at the rate of \$5 for every hour worked. The net wage per hour worked is only \$5 (the wage is effectively taxed at a rate of 50%).
    - **Two effects on budget line:** A) The endowment point shifts up due to the benefit. B) The slope of the budget line becomes flatter due to the benefit abatement!
    - As drawn, hours of work are reduced (new optimal point is R). Note: Movement from P to Q is the income effect from the cash benefit; movement from Q to R is the substitution effect.

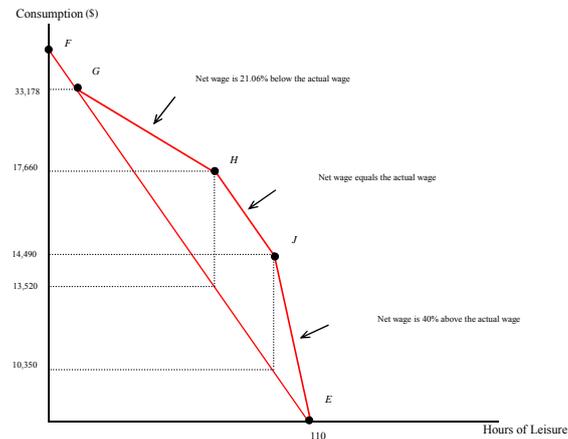
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## Effect of a Welfare Program on Hours of Work: Figure 2-15



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## 2.11 Policy Application: The EITC and the Budget Line



2-44

## Policy Application ctd.

- Most of the material in this section is very US specific and was not covered in class (it is also not compulsory). However, I briefly discussed a somewhat similar and very important NZ application “**Working for Families Tax Credits**”. See the **handout provided**. Further information is available at: <http://www.workingforfamilies.govt.nz/>
- I briefly discussed the ‘difference-in-difference’ estimator or method (using Table 2.5 to illustrate the approach). This is an important method used to estimate the impact of policies. You should understand the basic idea of this method.

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## 2.12 Labour Supply over the Life Cycle

- So far: “Static” model; this is not a complete depiction of how people allocate their time between work and leisure.
- In the next three sections the basic model is extended in order to consider:
  - The long run, i.e. labour supply over the life-cycle, and over the (shorter) business cycle.
  - ‘Household’ fertility decisions.

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## Labour Supply over the Life Cycle ctd.

- Wage rates change over the typical worker’s life cycle
  - Wages are low when young.
  - Wages rise with time and peak around age 50.
  - Wages decline or remain stable after the age of 50.
- Change in wage over the life cycle *of a particular person* is an “evolutionary” wage change altering the price of leisure and determining the person’s **age-earnings profile**.
- **Note:** An evolutionary wage change does NOT impact on a person’s lifetime income (it has already been incorporated in the calculation of lifetime wealth, i.e. it was expected). It has **no income effect**.

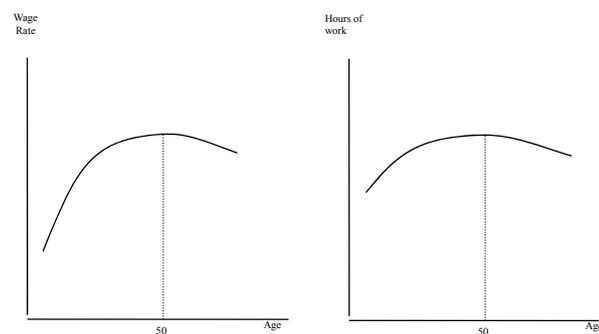
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## Theoretical issues of evolutionary wages

- The profile of hours of work over the life cycle will have the same shape as the age-earnings profile (see Figure 2-18a&b).
- Intertemporal substitution hypothesis: **People substitute their time over the life cycle to take advantages of changes in the price of leisure**, e.g. it makes sense to work more hours at age 50 when the wage is high than at age 60 (or 20) when it is lower.
- There is a positive relationship between changes in hours of work and changes in the wage rate for a particular worker (a person will work more hours when wages are higher, i.e. there is a substitution effect). Note discussion on pages 65/66.

2-48

## Figure 2-18a&b: The Life Cycle Path of Wages and Hours for a Typical Worker



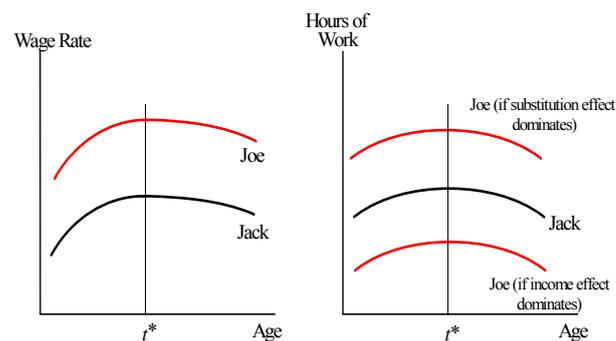
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## Comparing two workers

- Compare two workers with different age-earnings profiles. The difference in hours of work between these two would be affected by **both** income and substitution effects (see Figure 2-19a&b).
- Although one worker earns a higher wage at every age, that worker might, or might not, work more hours than the worker on the lower wage!

2-50

### Figure 2-19a&b: Hours of Work over the Life Cycle for Two Workers with Different Wage Paths



Joe's wage exceeds Jack's at every age. Although both Joe and Jack work more hours when the wage is high, Joe works more hours than Jack only if the substitution effect dominates. If the income effect dominates, Joe works fewer hours than Jack.

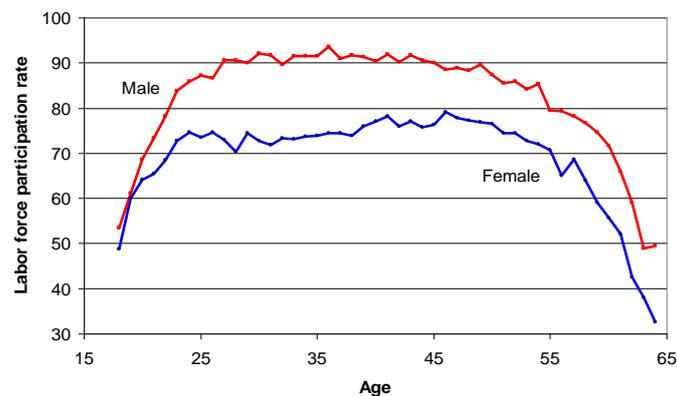
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### Another prediction of the life cycle approach: The link between wages and labour force participation rates

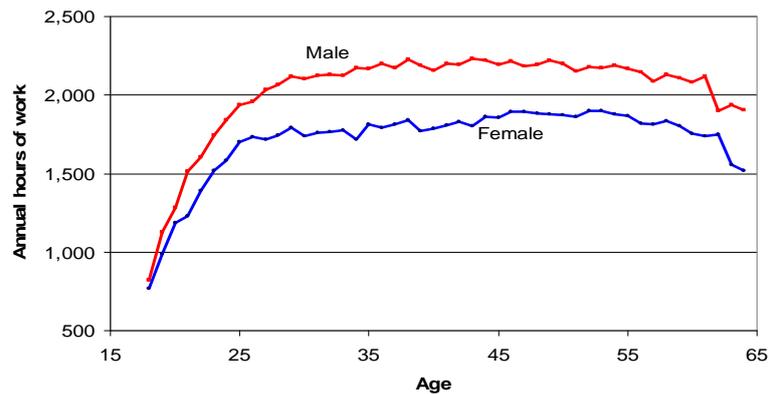
- In each year of the life cycle, a person will compare the reservation wage to the market wage. This might explain a lot about labour force participation rates:
  - If reservation wage were constant over the life cycle, the participation rate would be low for young and older worker, and highest for middle-aged workers.
  - Reservation wage varies over the life cycle of a person.
    - Example: Women with children might have a higher reservation wage, reducing their labour force participation. Once children are at school, value of time in the nonmarket sector falls again, and so does the reservation wage, leading to higher participation rates.
  - NZ labour force participation rates: See Table 14.05, chapter 14 of NZ Official Yearbook 2008. A diagram with 1999 NZ data was shown in class (from NZ Official Yearbook 2000, p. 323).

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### Figure 2-20: U.S. Labour Force Participation Rates over the Life Cycle in 2005



**Figure 2-21: U.S. Hours of Work over the Life Cycle, 2005**



## Estimates of the Intertemporal Substitution Hypothesis

- Many studies try to estimate the responsiveness of hours of work to changes in the wage over the life cycle.
- The data (see Figure 2-21) indicate that hours of work are 'sticky' over a long stretch of people's working lives.
- It seems the elasticity of hours worked to evolutionary wage changes is small, maybe 0.1.
- This is very controversial because it has **important implications** for assessing how appropriate some major macro-economic theories are (e.g. real business-cycle theory). See Note 45, p. 69 of the textbook.
  - One research finding: Male workers work longer when the weather is bad.

2-55

## Labour Supply over the Business Cycle

- Do recessions increase or decrease the labour supply? There are opposing effects and views on this issue.
- **Added-worker effect:**
  - So-called “secondary” workers currently out of the labour market are affected by a recession because the main breadwinner becomes unemployed or faces a wage cut.
- This implies the labour force participation rate of secondary workers has a counter-cyclical trend (it goes up during recessions, down during booms).

2-56

## Labour Supply over the Business Cycle, ctd.

- **Discouraged worker effect:**
  - Unemployed workers find it almost impossible to find jobs during a recession, so they give up searching.
- Implies that labour force participation is pro-cyclical (it goes down during recessions, up during booms).
- There is a overwhelming evidence that the discouraged worker effect dominates the correlation between labour force participation and the business cycle, i.e. recessions result in lower labour force participation rates.

2-57

### Labour Supply over the Business Cycle, ctd.: Official Unemployment Rates are always controversial!

- Therefore, the official unemployment rate might greatly understate the actual unemployment problem during recessions.
- However, it is not clear whether the discouraged workers (the ‘hidden unemployed’) should be included in the official unemployment rate because (see pp. 70/71):
  - Their number is difficult to estimate accurately. Some of the hidden unemployed will have left the labour force a long time ago (and forever), others will have voluntarily left and will rejoin later.
  - Another related problem (not mentioned in the textbook) is that of ‘involuntary part-time workers’.
- A one page handout from the Economist (‘Counting the jobless’) that supplements the material in this section was provided in class. Some NZ data were also shown.

2-58

### More on ‘added worker effect’

- Job creation and destruction are a normal part of economic activity, i.e. they also happen when there is no recession or boom.
- Therefore, the added worker effect applies whenever the main earner of a couple loses his/her job.
- The textbook cites US evidence of a sizable positive labour supply response by the wife to the husband’s unexpected job loss (compensating for over 25 % of the loss of family income).
  - Note: The extent to which people receive unemployment benefit will also affect the partner’s labour supply response.
-

2-59

## 2.13 Policy Application: The Decline in Work Attachment among Older Workers

- This section is very US specific and NOT relevant for exam purposes.
- A few comments:
  - An increase in pension benefits reduces the price of retirement, increasing the demand for leisure, encouraging the worker to retire earlier (and vice versa), but evidence that this is an important effect is surprisingly scarce!
  - The Figures in this section assume no mandatory retirement age (applies to US, NZ,...). Many countries still do have mandatory retirement ages.
  - Try to understand the ‘difference-in-difference’ analysis of Table 2-6 (labour supply impact of increasing disability benefits in different parts of Canada to different degrees).
- I discussed Problems 2-9, 2-10, 2-11 in class.

2-60

## 2.14 Fertility

- Analysis of the fertility decisions of households - Another example of the flexibility and adaptability of the neoclassical model!
- Fertility decisions affect the size of the population and the long-run labour supply.
- Malthusian Model of Fertility (1798): As incomes rise, families want to have more children (focus on income effect). In the long-run, wages cannot rise above the subsistence level. Very pessimistic, and incorrect, theory!
- Instead, an increase in the price of a person’s time (an increase in the wage rate) will increase the opportunity cost of rearing children (the forgone income), plus children have very high direct costs.

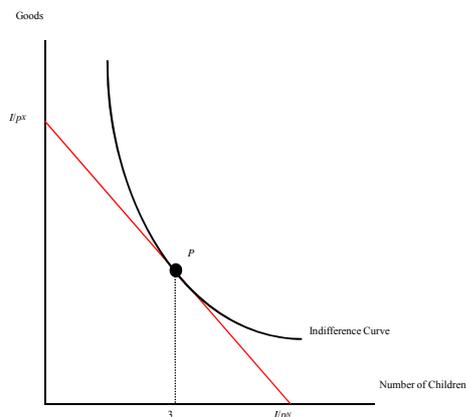
2-61

## Fertility, ctd.

- The model treats children ‘like a commodity’. The household can spend its income on some combination of goods and children (see Figure 2-23).
- Optimal point where “the last \$ spent on children yields as much utility as the last \$ spent on goods”. **DO YOU STILL LIKE ECONOMISTS?**
  - See footnote 61, p. 79. The simple model has been extended to account for the utility parents derive from the ‘quality’, not just the ‘quantity’, of children!

2-62

## Figure 2-23: The Fertility Decision



The household's utility depends on the number of children and on the consumption of goods. A utility-maximizing household chooses point  $P$  and has three children.

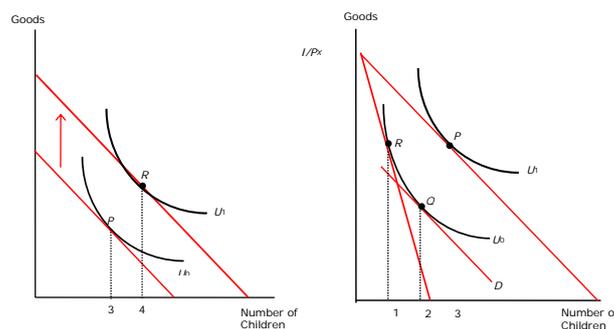
2-63

## Income and Price Changes and the Fertility Decision

- Income  $\uparrow$  (with constant prices), demand for children  $\uparrow$  if children are a normal good (Figure 2-24a).
  - This income effect results in a positive correlation between income and fertility (like suggested by Malthus).
- But over time, the cost of having children has also greatly increased: Price of children  $\uparrow$  (budget line rotates inwards), demand for children  $\downarrow$  (Figure 2-24b).
  - Decompose move from old to new equilibrium into income and substitution effect.
- In short, the theory says that when children are cheap, people will have many, and vice versa.
  - Example: Rural families tend to have more children.
  - Data show a strong negative correlation between a women's wage rate and the number of children she has, etc.

2-64

### Figure 2-24: The Impact of Income and Prices on the Household's Fertility



(a) Increase in Income:  
Budget line shifts out

(b) Increase in the price of children:  
Budget line rotates inwards

2-65

## Does Fertility Really Respond to Economic Variables?

- This section in the textbook reports some interesting evidence:
  - Even the timing of births responds to economic factors:
    - US tax year example.
    - Australian 'baby bonus' example.
  - Other examples of government policy affecting fertility:
    - China's one-child policy.
    - Some European countries with low birth rates provide large financial incentives to have babies (but does it always work?)

2-66

**End of Chapter 2**