Master in Economics

Labour economics – Lecture 3

Feb 2025

Lecture 3

Topics:

- **The demand for labour and labour elasticities**
  - The Own-Wage Elasticity of Demand
  - The Cross-Wage Elasticity of Demand
  - Policy Application: Effects of Minimum Wage Laws
  - Applying Concepts of Labour Demand Elasticity to the Issue of Technological Change

- **Supply of Labour to the Economy: The Decision to Work**

Bibliography:

- Ehrenberg, Ronald & Smith, Robert Modern Labor Economics: Theory and Public Policy – Chapters 4 and 6

Chapter 3: The demand for labour and labour elasticities

Chapter Outline

- ## The Own-Wage Elasticity of Demand
  - **The Hicks-Marshall Laws of Derived Demand**
  - **Estimates of Own-Wage Labour Demand Elasticities**
  - **Applying the Laws of Derived Demand: Inferential Analysis**

- ## The Cross-Wage Elasticity of Demand
  - **Can the Laws of Derived Demand Be Applied to Cross-Elasticities?**
  - **Estimates Relating to Cross-Elasticities**

- ## Policy Application: Effects of Minimum Wage Laws
  - **History and Description**
  - **Employment Effects: Theoretical Analysis**
  - **Employment Effects: Empirical Estimates**
  - **Does the Minimum Wage Fight Poverty?**
  - **"Living Wage" Laws**

- ## Applying Concepts of Labour Demand Elasticity to the Issue of Technological Change

Labour demand elasticities

- Motivation: which are the employment effects of minimum wage laws?

- Prediction of the simple model:
  - If wages set above the market clearing level, employment opportunities are reduced

- Card & Krueger (1995) – *Myth and measurement: the New Economics of the Minimum Wage* – the result cannot be observed or at least does not exhibit any regularity…

Labour demand elasticities

- Big debate: how responsive is employment demand to changes in wages?
  - All accept that if wage increases are big there will be huge job losses but how many jobs losses will we see if wage increases are modest?

- Aim of this chapter:
  - Study how does employment respond to wage changes…
    … measured as elasticities – the percentage change of employment when wage changes 1%

The Own-Wage Elasticity of Demand

The own-wage elasticity of demand:

$$\eta_{ii} = \frac{\Delta\% E_i}{\Delta\% W_i}$$

- η_{ii} is relatively elastic labour demand if the $\Delta\%E_i > \Delta\%W_i$ - $(\eta_{ii}>1)$
- η_{ii} is relatively inelastic labour demand if the $\Delta\%E_i < \Delta\%W_i$ - $(\eta_{ii}< 1)$
- η_{ii} is unitary elastic labour demand if the $\Delta\%E_i = \Delta\%W_i$ - $(\eta_{ii}=1)$
- η_{ii} is perfectly elastic if the $\Delta\%E_i$ is infinite for any $\Delta\%W_i$
- η_{ii} is perfectly inelastic labour demand if the $\Delta\%E_i$ is zero for positive or negative changes in the wage rate $\Delta\%W_i$
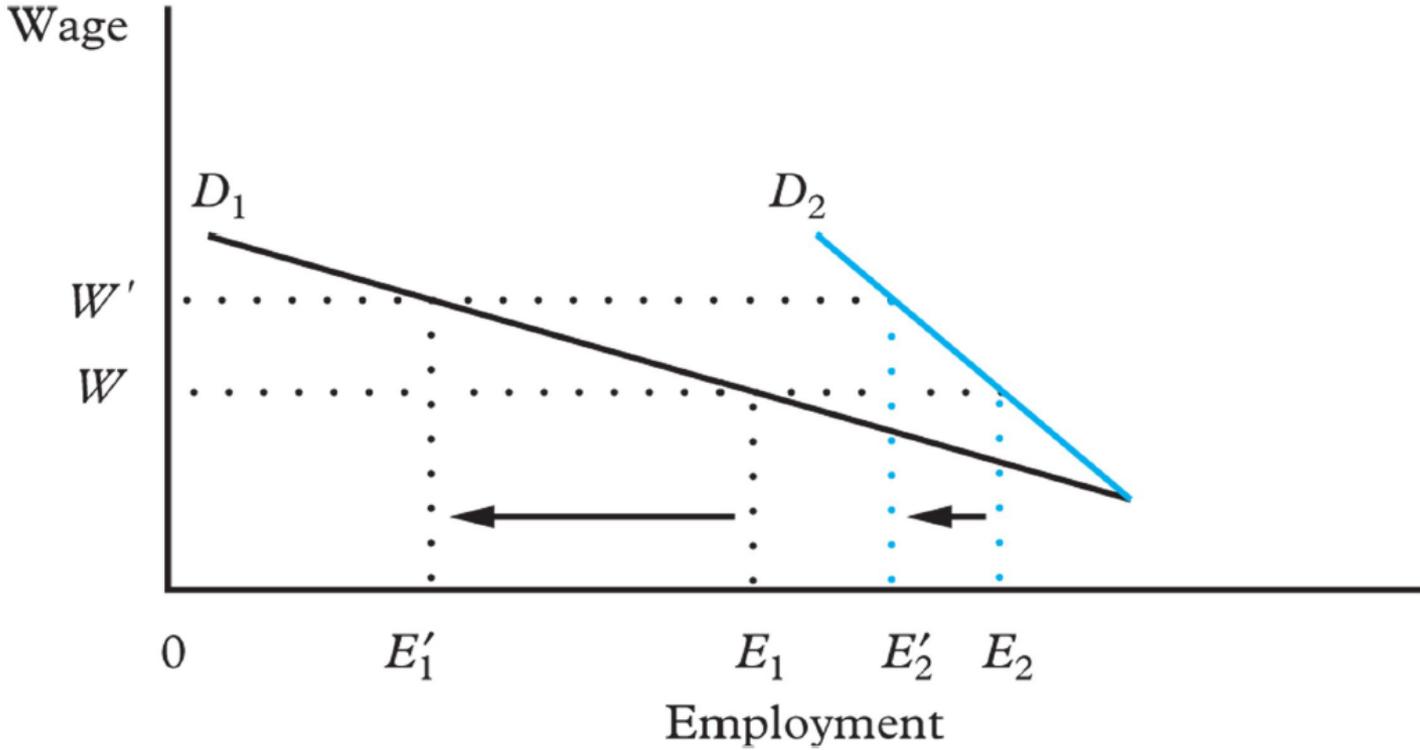
The Own-Wage Elasticity of Demand

The own-wage elasticity of demand:

- **If labour demand is elastic, aggregate earnings decrease when the wage rate increases**
- **If labour demand is inelastic, aggregate earnings increase when the wage rate increases**
- **If labour demand is unitary elastic, aggregate earnings will remain unchanged when the wage rate increases**

The Own-Wage Elasticity of Demand

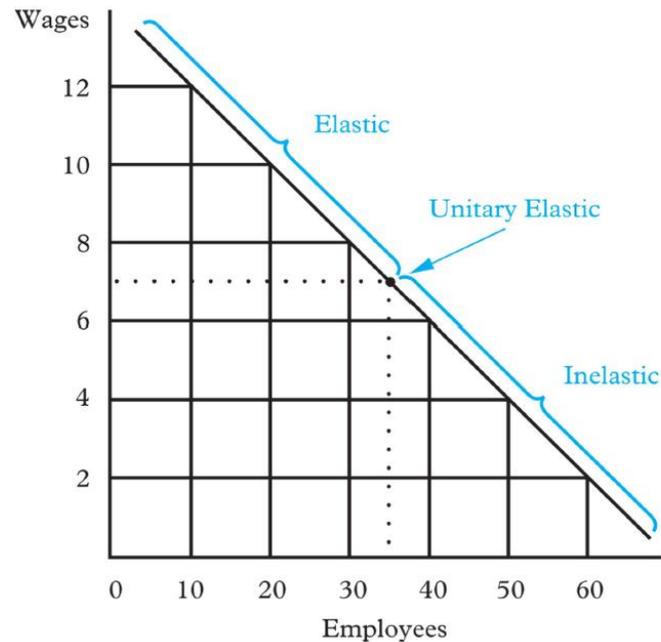**Figure 4.1** Relative Demand Elasticities

The Own-Wage Elasticity of Demand

The own-wage elasticity of demand:

- Problem: the demand curve does not have an elasticity – it has elastic and inelastic ranges

Figure 4.2 Different Elasticities along a Demand Curve

The Hicks-Marshall Laws of Derived Demand

Other things equal, the own-wage elasticity of demand for a category of labour is generally higher under the following conditions:

- Price elasticity of demand for the product being produced is higher
- Other factors of production can be more easily substituted for labour
- The supply of other factors of production is more elastic
- The cost of employing labour is a larger share of the total costs of production

The Hicks-Marshall Laws of Derived Demand

Divide the effects of a wage increase on the labour demand into 2 effects:

- The increase in the wage rate increases the relative cost of that category of labour and that induces employers to use less of it – *substitution effect*
- The wage increases cause the marginal costs of production to rise and that reduces production and labour demand – *scale effect*

The Hicks-Marshall Laws of Derived Demand

Demand for the Final Product

- The demand for labour at firm level is more elastic than the demand at industry or market level – easier to substitute a product between different firms than between different products

- Wage elasticities will be higher in the long run than in the short run – easier to substitute products in the long run

Conclusion: The greater the elasticity of demand for the final product, the greater the elasticity of demand for labour

The Hicks-Marshall Laws of Derived Demand

Substitutability of Other Factors

- If there are no substitution possibilities, there is no reduction in employment due to the substitution effect
- When substitution possibilities exist, a reduction in employment due to the substitution effect will accompany whatever reductions are caused by the scale effect

Conclusion: The easier it is to substitute factors of production, the greater the wage elasticity of labour demand

The Hicks-Marshall Laws of Derived Demand

The Supply of Other Factors

- Example: If an increase in the wages of unskilled workers cause employers to attempt to substitute skilled employees for unskilled employees, the wages of the skilled workers would be bid up by employers – the incentive to substitute is reduced

- If the price of other inputs did not increase when employers attempted to increase their use, the *substitution effect* – the wage elasticity of labour demand – would be larger

Conclusion: The larger the supply of alternative inputs, the greater the wage elasticity of labour demand

The Hicks-Marshall Laws of Derived Demand

The share of labour in total costs

- The greater the share of labour costs on the total costs, the larger the impact of a wage increase in total costs

Conclusion: The greater the share of a category of labour in total costs, the greater the wage elasticity of demand

Estimates of the Own-Wage Elasticity of Demand

- Employers' labour demand responses to a wage change can be broken down into two components:
  - Scale effect
  - Substitution effect

- The two effects can be expressed in terms of elasticities which can be added into the own wage labour demand elasticity
  - The short-run scale effect (elasticity):

$$\eta_{ii} = \left.\frac{\Delta\%E_i}{\Delta\%W_i}\right| holding\ production\ technology\ constant$$

  - The substitution effect (elasticity)

$$\eta_{ii} = \left.\frac{\Delta\%E_i}{\Delta\%W_i}\right| holding\ output\ constant$$

The Own-Wage Elasticity of Demand

Components of the Own-Wage Elasticity of Demand for Labor: Empirical Estimates Using Plant-Level Data

	Estimated Elasticity
Short-Run Scale Effect	
British manufacturing firms, 1974–1982	−0.53
Substitution Effect	
32 studies using plant or narrowly defined industry data	Average: −0.45 (typical range: −0.15 to −0.75)
Overall Labor Demand Elasticity	
British plants, 1984	−0.93
British coal mines, 1950–1980	−1.0 to −1.4

The Own-Wage Elasticity of Demand

Laws of Derived Demand: Inferential Analysis

- Use the laws to predict some outcomes
  - Example: demand for unionized workers – since labour demand elasticities and wage gains are related
    - Unions would win larger wage gains for their members in markets with inelastic labour demand curves.
    - Unions would strive to take actions that reduce the wage elasticity of demand for their members' services.
    - Unions might first seek to organize workers in markets in which labour demand curves are inelastic – large potential gains
  - Example: demand for unionized airplane pilots
    - Low share of costs and low substitution – labour demand quite inelastic

The Cross-Wage Elasticity of Demand

The cross-wage elasticity of demand:

$$\eta_{jk} = \frac{\Delta\%E_j}{\Delta\%W_k} \quad \text{or} \quad \eta_{kj} = \frac{\Delta\%E_k}{\Delta\%W_j}$$

- **If the two inputs are substitutes**
  - If η_{jk} and $\eta_{kj} > 0$, inputs *j* and *k* are gross substitutes
  - If η_{jk} and $\eta_{kj} < 0$, inputs *j* and *k* are gross complements

The Cross-Wage Elasticity of Demand

Can the Laws of Derived Demand be applied to Cross-Elasticities?

- The Hicks-Marshall laws of derived demand that were applied to η_{ii} cannot be applied directly to η_{jk} because the substitution effect and the scale effect work in opposite directions

The Cross-Wage Elasticity of Demand

Can the Laws of Derived Demand be applied to Cross-Elasticities?

- **The Scale Effect - the size of the scale effect will depend**
  - **on $TC_L/TC(Q)$**
  - **the greater the price elasticity of product demand, the greater the scale effect (and thus the greater the likelihood of gross complementarity)**

The Cross-Wage Elasticity of Demand

Can the Laws of Derived Demand be applied to Cross-Elasticities?

- The Substitution Effect – are the two inputs substitutes or complements in production?
  - If complements, the use of more of one input will reinforce the scale effect and unambiguously increase the use of the other input
  - If substitutes, more of one input will be used, then overall effect depends on relative size of the substitution effect and the scale effect

  More elastic supply curves of substitute inputs increase the substitution effect

The Cross-Wage Elasticity of Demand

Estimates of Cross-Elasticities

- Knowing the sign of cross-wage labour demand elasticities is useful for answering many public-policy questions - crucial to know whether two inputs are gross complements or gross substitutes in production

- Empirical studies that paired together factors of production offer (at least) a few generalizations:
  - Labour and energy (materials) are clearly (probably) substitutes in production, although their degree of substitutability is small
  - Skilled and unskilled labour are substitutes in production
  - Uncertain whether skilled or unskilled L substitute or complement with K, but it appears that skilled L is more likely to be complementary with K than is unskilled L
  - Skilled L is more likely to be a gross complement with K
  - If wages of both skilled and unskilled L were to rise by the same percentage, employment loss will be greater for unskilled

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Theoretical Analysis

- The main concern about W_{min} legislation has been whether it will reduce the employment of the targeted groups

- Economic theory suggests that W_{min} can be expected to reduce employment opportunities for the least skilled or least experienced workers

- If $\Delta\% E_i > -\Delta\% W_i$ (labour demand curve for this group is relatively elastic), aggregate earnings of low-wage workers could decrease with an increase in W_{min}

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Theoretical Analysis – predictions from the theory to consider in the analysis

- **Nominal *vs* Real Wages:**
  - Minimum wages set nominally and adjusted sporadically – real minimum wage changes over time even if there is a fixed nominal wage – the incentives to employment change
  - Differences in prices generate different real minimum wages - different employment effects
- **Holding other things constant**
  - Predictions of effects of minimum wages made holding other things constant, namely fixed labour demand
  - The labour demand may shift at the same time – confounded effects

Policy Application: Effects of Minimum Wage

In year 1, two things happened: i) W_{min} is raised to W_2 such that $W_2/P_1 > W_1/P_1 = W_0/P_0$ and ii) **economic expansion** led to an increase in demand for low-skilled labour/workers
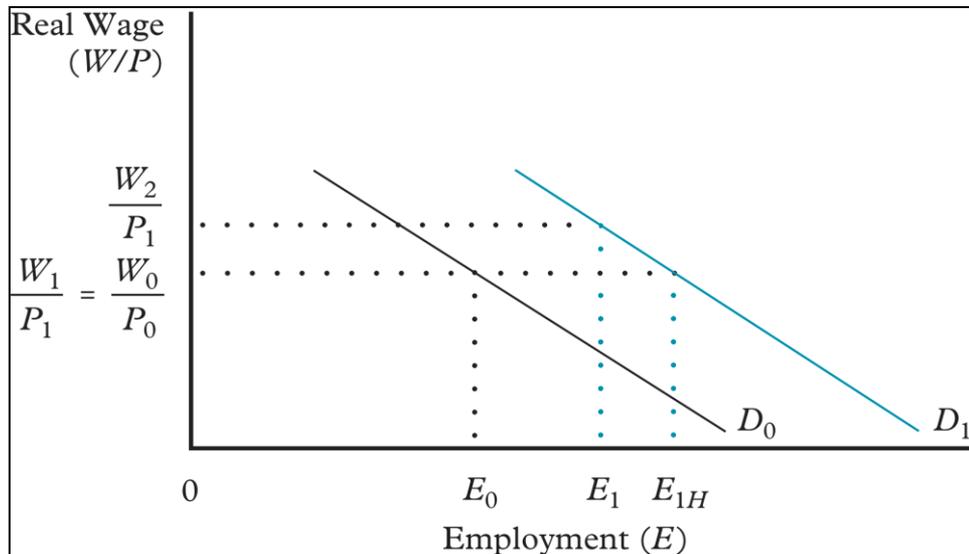

Loss in employment due to W_{min} is: $E_{1H} - E_1$
Economic expansion "blurs" impact - it's the growth rate that decreases

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Theoretical Analysis – predictions from the theory to consider in the analysis

- **Effects of Uncovered Sectors:**
    - **Minimum wage laws do not have full coverage and there is noncompliance**
    - **They affect the response of low wage workers employment to wage changes – the overall loss of employment likely to be lower than in the covered sector**

(a) Covered Sector

(b) Uncovered Sector
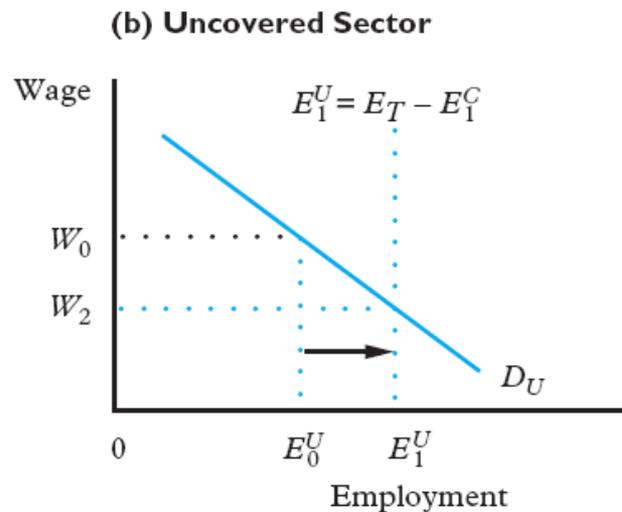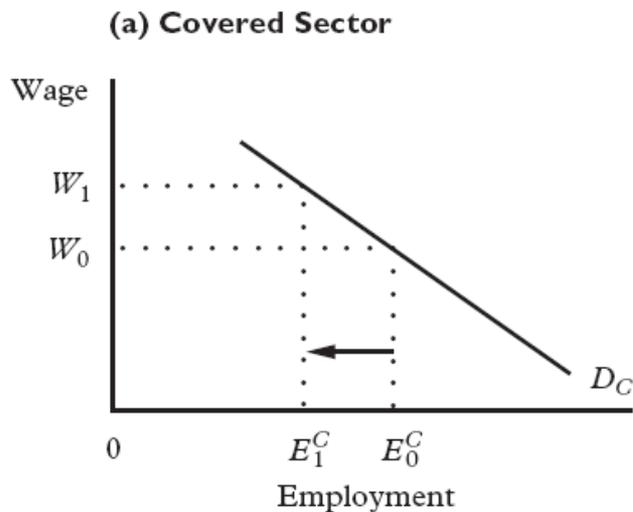
$$E_1^U = E_T - E_1^C$$

With no W_{min}, total employment in both sectors is: $E_T = E_0^C + E_0^U$

With W_{min} in the covered sector, employment decreases: $E_0^C - E_1^C$

Employment in the uncovered sector increases: $E_1^U = E_0^U + \left(E_0^C - E_1^C \right)$

$$\therefore E_1^U = E_0^U + \left(E_0^C - E_1^C \right) = E_T - E_1^C$$

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Theoretical Analysis – predictions from the theory to consider in the analysis

- **Intersectoral shifts in product demand**
    - **Firms' increases in costs due to minimum wage are greater when the share of low wage labour in total costs is greater – the same increase in minimum wage leads to different effects on different product prices – effect on those suffering the least may be positive due to substitution of product demand**

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Empirical estimates

- Initial employment effects of adopting a minimum wage in the United States were readily observed

    - Andrew J. Seltzer, "The Effects of the Fair Labor Standards Act of 1938 on the Southern Seamless Hosiery and Lumber Industries"
        - a longitudinal survey of 87 firms shows that employment (had been rising) reversed course and started to fall, even though overall demand for the product and production levels were rising
        - employment fell by 5.5 percent in southern mills but rose by 4.9 percent in northern mills

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Empirical estimates

- Effects of more recent increases are not as obvious
    - studies of employment changes in the fast-food industry disagree on whether employment was affected at all by minimum wage increases in the early 1990s
    - a study that reviewed and updated previous estimates of how overall teenage employment has responded to increases in the minimum wage found negative effects on employment - once account is taken of the extent to which minimum wage increases raised the average wage of teenagers, the implications of this latter study are that the elasticity of demand for teenagers is in the range of -0.4 to -1.9
    - a recent estimate of how increases in the minimum wage affects employment for all low-wage workers, not just teenagers, suggests an own-wage labour demand elasticity that is considerably lower

Policy Application: Effects of Minimum Wage Laws

Employment Effects: Empirical estimates

- **Does the Minimum Wage Fight Poverty?**

  - **studies found that many who live in poverty are not affected by W_{min}, either because they are not employed (that is, they cannot find jobs at the W_{min}) or because their $W > W_{min}$**

  - **studies found that many of those most affected by W_{min} are teenagers, who may not reside in poor families**

Applying Concepts of Labour Demand Elasticity to the Issue of Technological Change

Two aspects of technological change – product innovation and process innovation – can affect both the product demand and labour demand curves

- **Product Demand Shifts**
  - **technological change (product innovation) will necessitate some painful changes in established industries, as workers, unions, and employers must all adjust to a new environment**
- **Substitutes or complements in production**
  - **process innovation (often associated with automation) can be viewed as reducing the cost of capital**
  - **new technologies tend to be substitutes in production with occupations that perform repetitive functions**
  - **new technologies tend to be complements in production with occupations that create them or use them to be more productive**

Applying Concepts of Labour Demand Elasticity to the Issue of Technological Change

Gross substitutes or gross complements in production

- if a category of labour is complement in production with the new technology no substitution effect – gross complements

- if substitution exists, they can be gross complements or substitutes depending on whether scale or substitution effects dominates – studies find that technological change has increased demand for workers at both ends of wage spectrum - polarization

Applying Concepts of Labour Demand Elasticity to the Issue of Technological Change

Overall Effects of Technological Change

- technological innovations – process and product – affect the demand for labour through both scale and substitution effects.

- technological change imposes cost on some workers – those who face decreased demand for their services and must bear the costs (wage loss, temporary unemployment, or the need to invest in learning new skills) of changing jobs.

- technological change increases society's production and consumption possibilities

Applying Concepts of Labour Demand Elasticity to analyse Technological Changes

Empirical Study: Estimating the labour demand curve and labour demand elasticities - Time Series Data and Coping with "Simultaneity"

- Estimating the elasticity of demand for labour is actually very difficult
  - Difficult to obtain data – we need data on wages and employment of workers who are homogeneous in many characteristics - requires analyzing groups so narrow that data are difficult to obtain.
  - W and E are determined simultaneously by the interaction of supply and demand curves – problems of identification - drawing a line between points a in D_1 and b in D_2 traces out neither a supply nor a demand curve

Diagram #1

Diagram #2
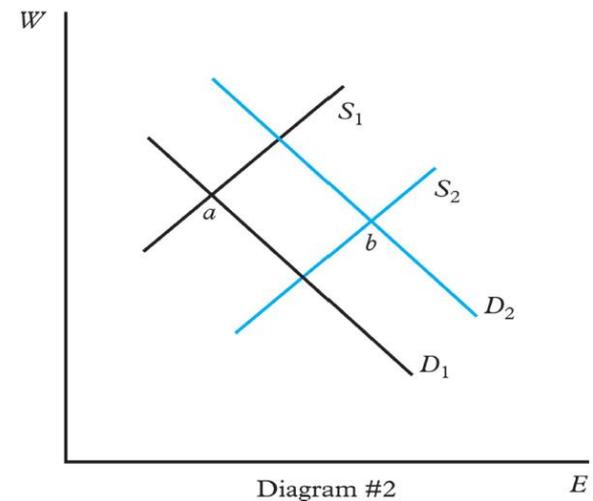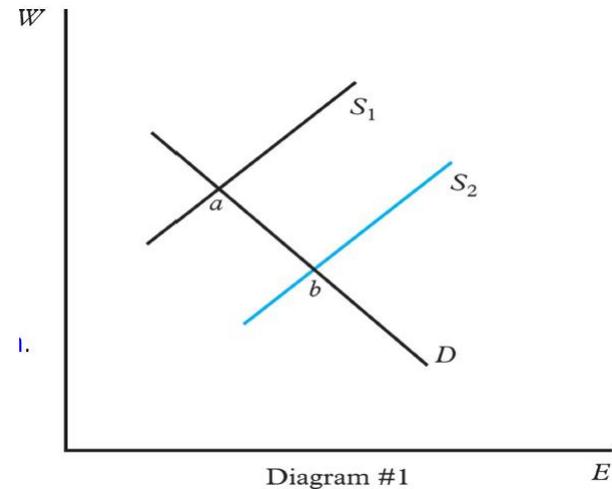
Chapter 4: Supply of Labour to the Economy: The Decision to work

Chapter Outline

- ## Trends in Labour Force Participation and Hours of Work

  - **Labour Force Participation Rates**
  - **Hours of Work**

- ## A Theory of the Decision to Work

  - **Some Basic Concepts**
  - **Analysis of the Labour / Leisure Choice**
  - **Empirical Findings on the Income and Substitution Effects**

- ## Policy Applications

  - **Budget Constraints with "Spikes"**
  - **Programs with Net Wage Rates of Zero**
  - **Subsidy Programs with Positive Net Wage Rates**

Trends in Labour Force Participation and Hours of Work

- The labour force participation rate

$$LFPR = \frac{LF}{WAP} * 100$$

- Labour force participation rates
  - $LFPR_{Women}$ more than doubled over the past ten decades in the US while the $LFPR_{Men}$ decreased
  - Similar trends observed in other advanced countries – Canada, France, Germany, Japan, and Sweden

- Hours of work
  - American workers used to work 55 hours per week, but that has declined to less than 40 hours per week

Trends in Labour Force Participation and Hours of Work

Table 6.1 Labor Force Participation Rates of Females in the United States over 16 Years of Age, by Marital Status, 1900–2014 (Percentage)

Year	All Females	Single	Widowed, Divorced	Married
1900	20.6	45.9	32.5	5.6
1910	25.5	54.0	34.1	10.7
1920	24.0			9.0
1930	25.3	55.2	34.4	11.7
1940	26.7	53.1	33.7	13.8
1950	29.7	53.6	35.5	21.6
1960	37.7	58.6	41.6	31.9
1970	43.3	56.8	40.3	40.5
1980	51.5	64.4	43.6	49.8
1990	57.5	66.7	47.2	58.4
2000	59.9	68.9	49.0	61.1
2010	58.6	63.3	48.8	61.0
2014	57.0	62.9	47.3	58.4

Trends in Labour Force Participation and Hours of Work

Table 6.2 Labor Force Participation Rates for Males in the United States, by Age, 1900–2014 (Percentage)

	Age Groups					
Year	14–19	16–19	20–24	25–44	45–64	Over 65
1900	61.1		91.7	96.3	93.3	68.3
1910	56.2		91.1	96.6	93.6	58.1
1920	52.6		90.9	97.1	93.8	60.1
1930	41.1		89.9	97.5	94.1	58.3
1940	34.4		88.0	95.0	88.7	41.5
1950	39.9	63.2	82.8	92.8	87.9	41.6
1960	38.1	56.1	86.1	95.2	89.0	30.6
1970	35.8	56.1	80.9	94.4	87.3	25.0
1980		60.5	85.9	95.4	82.2	19.0
1990		55.7	84.4	94.8	80.5	16.3
2000		52.8	82.6	93.0	80.4	17.7
2010		34.9	74.5	90.6	79.4	22.1
2014		33.5	73.9	89.6	78.1	23.0

Sources: 1900–1950: Clarence D. Long, *The Labor Force under Changing Income and Employment* (Princeton, NJ: Princeton University Press, 1958), Table A–2.

1960: U.S. Department of Commerce, Bureau of the Census, Census of Population, 1960: Employment Status, Subject Reports PC(2)–6A, Table 1.

1970: U.S. Department of Commerce, Bureau of the Census, Census of Population, 1970: Employment Status and Work Experience, Subject Reports PC(2)–6A, Table 1.

1980–2011: U.S. Census Bureau, 2010 Statistical Abstract, Section 12 (Table 575), www.census. gov/compendia/statab/2010edition.html; and U.S. Department of Labor, Bureau of Labor Statistics, *Women in the Labor Force: A Databook*, Report 1034 (December 2011), and Report 1059 (December 2015), Table 1.

Trends in Labour Force Participation and Hours of Work

Table 6.3 Labor Force Participation Rates of Women and Older Men, Selected Countries, 1965–2014 (Percentage)

Country	1965	1973	1983	1993	2014
Women, Age 25 to 54					
Canada	33.9	44.0	65.1	75.6	81.9
France	42.8	54.1	67.0	76.1	83.5
Germany	46.1	50.5	58.3	72.5	82.4
Japan	–	53.0[a]	59.5	65.2	74.5
Sweden	56.0	68.9	87.1	88.2	88.0
United States	45.1	52.0	67.1	74.6	73.9
Men, Age 55 to 64					
Canada	86.4	81.3	72.3	60.4	69.7
France	76.0	72.1	53.6	43.5	53.1
Germany	84.6	73.4	63.1	53.0	75.5
Japan	–	86.3[a]	84.7	85.4	94.8
Sweden	88.3	82.7	77.0	70.9	81.7
United States	82.9	76.9	69.4	66.5	69.9

[a] Data are for 1974 (earlier data not comparable).

Source: Organisation for Economic Co-operation and Development, Labour Force Statistics (Paris: OECD, various dates), https://stats.oecd.org/index.aspx?DataSetCode=LFS_SEXAGE_I_R#

A Theory of the Decision to Work

- Labour is the most abundant and important factor of production - a country's economic performance depends on the willingness of its people to work

- A person's discretionary time (16 hours a day) can be spent:
  - working for pay to derive income (Y) for consumption
  - leisure (L) – ways of spending time that do not involve work for pay

- Important to understand the work-incentive of higher wages, taxes, and other factors

A Theory of the Decision to Work

- ## Some Basic Concepts
  - the demand for a good/service depends on:
    - the opportunity cost of the good = market price
    - one's level of wealth
    - one's set of preferences
  - opportunity cost of leisure:
    - equal to one's wage rate or the extra earnings a worker can take home from an extra hour of work
  - wealth and income:
    - wealth: assets such as family's holdings of bank accounts, financial investments, physical property or properties
    - income: the return on wealth

- ## The effects of increases in income and wages on leisure-work preferences of a person can be categorized as:
  - income effect
  - substitution effect

A Theory of the Decision to Work

- **The Income Effect**
  - if income increases, holding wages constant, desired hours of work will go down

$$\text{Income effect} = \left.\frac{\Delta H}{\Delta Y}\right|_{\bar{W}} < 0$$

- **The Substitution Effect**
  - if income is held constant, an increase in the wage rate will raise the price and reduce the demand for leisure, increasing work incentives

$$\text{Substitution effect} = \left.\frac{\Delta H}{\Delta W}\right|_{\bar{Y}} > 0$$

- **Observing Income and Substitution Effects Separately**
  - when wages change, there are income and substitution effects
  - receiving an inheritance - an example of a pure income effect, which induces the person to consume more leisure, thus reducing the willingness to work
  - rare to observe the substitution effect by itself

A Theory of the Decision to Work

Both Effects occur when Wages Rise

- a wage increase will involve both an income effect and a substitution effect – the two effects work in opposite directions

- ambiguity in predicting the overall labour supply response in many cases
  - If the income effect is stronger, the labour supply curve will be negatively sloped - as $W\uparrow \rightarrow H\downarrow$
  - If the substitution effect dominates, the labour supply curve will be positively sloped – as $W\uparrow \rightarrow H\uparrow$

A Theory of the Decision to Work
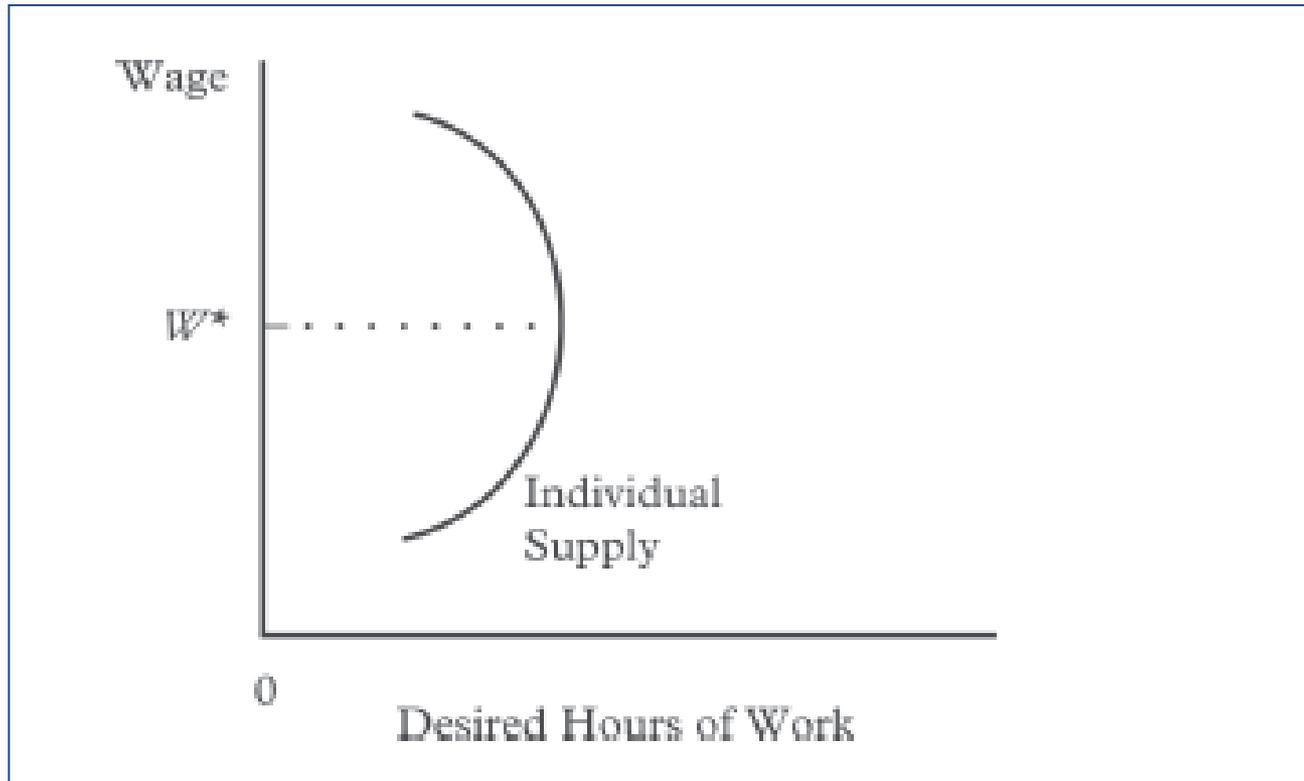
A Theory of the Decision to Work

Analysis of the Labour / Leisure Choice

- using the concept of indifference curves and budget constraints to understand the theory of labour supply

- preferences

$$U = f(Y, L)$$

where
  - U is an index that measures the level of satisfaction or happiness, Y is income (wage) and L is leisure
  - higher U means higher levels of utility that will make a person happier

- along the indifference curve:

$$\Delta Y . MU_Y + \Delta L . MU_L = 0$$

$$-\frac{\Delta Y}{\Delta L} = \frac{MU_L}{MU_Y} \quad \text{or} \quad \frac{\Delta Y}{\Delta L} = -\frac{MU_L}{MU_Y} = MRS_{Y,L}$$

A Theory of the Decision to Work

Characteristics of the indifference curves:

- indifference curves to the northeast represent a higher level of utility
- indifference curves do not intersect
- indifference curves are negatively sloped
- indifference curves are convex – steeper at the left than at the right – when income is high, leisure hours are relatively few and so leisure hours are highly valued
- moving down on the indifference curve reflects value – when income is low, leisure hours are abundant and so they are less valued
- indifference curves differ among individuals because of the differences in tastes/preferences or values

A Theory of the Decision to Work

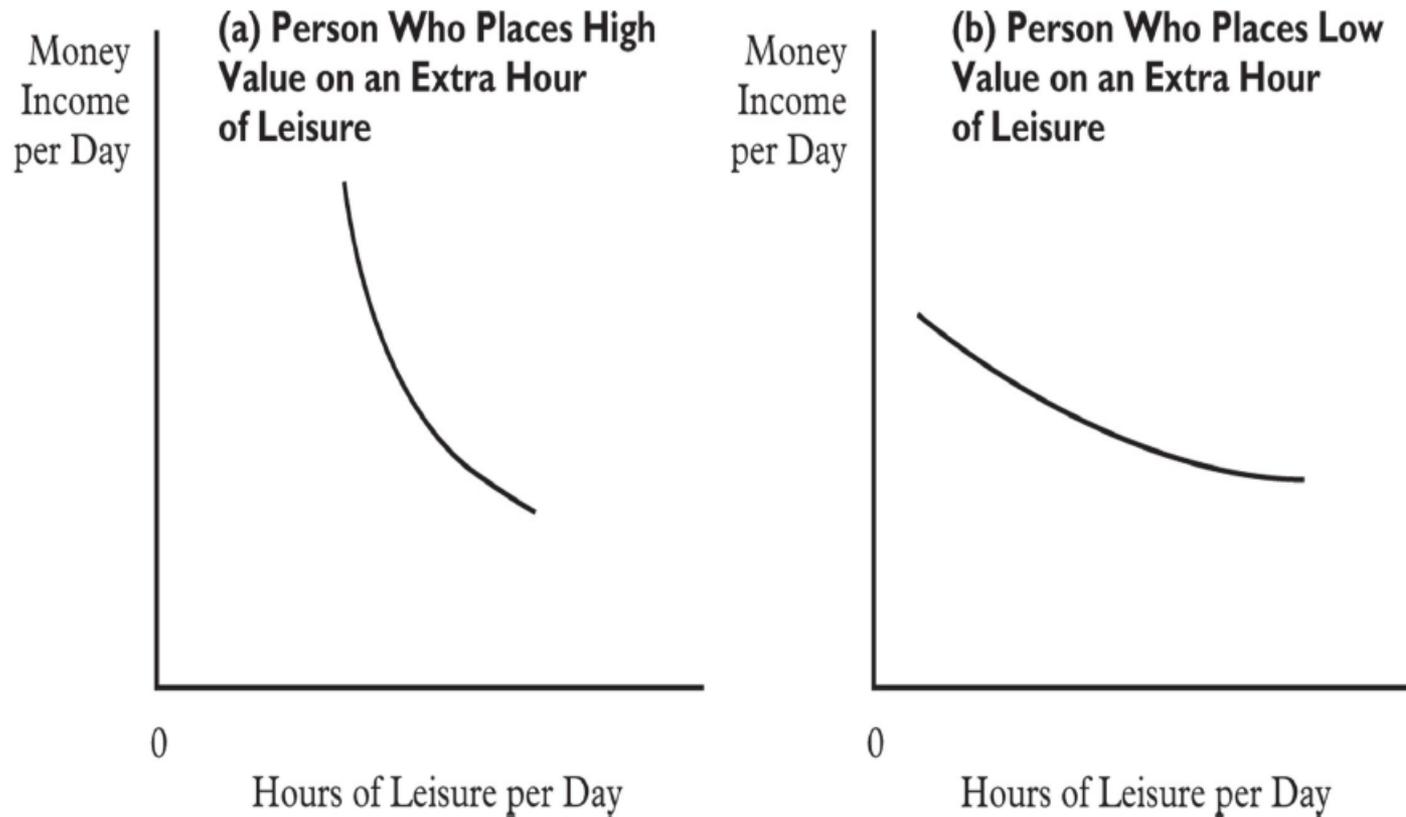**Figure 6.2**   Two Indifference Curves for the Same Person
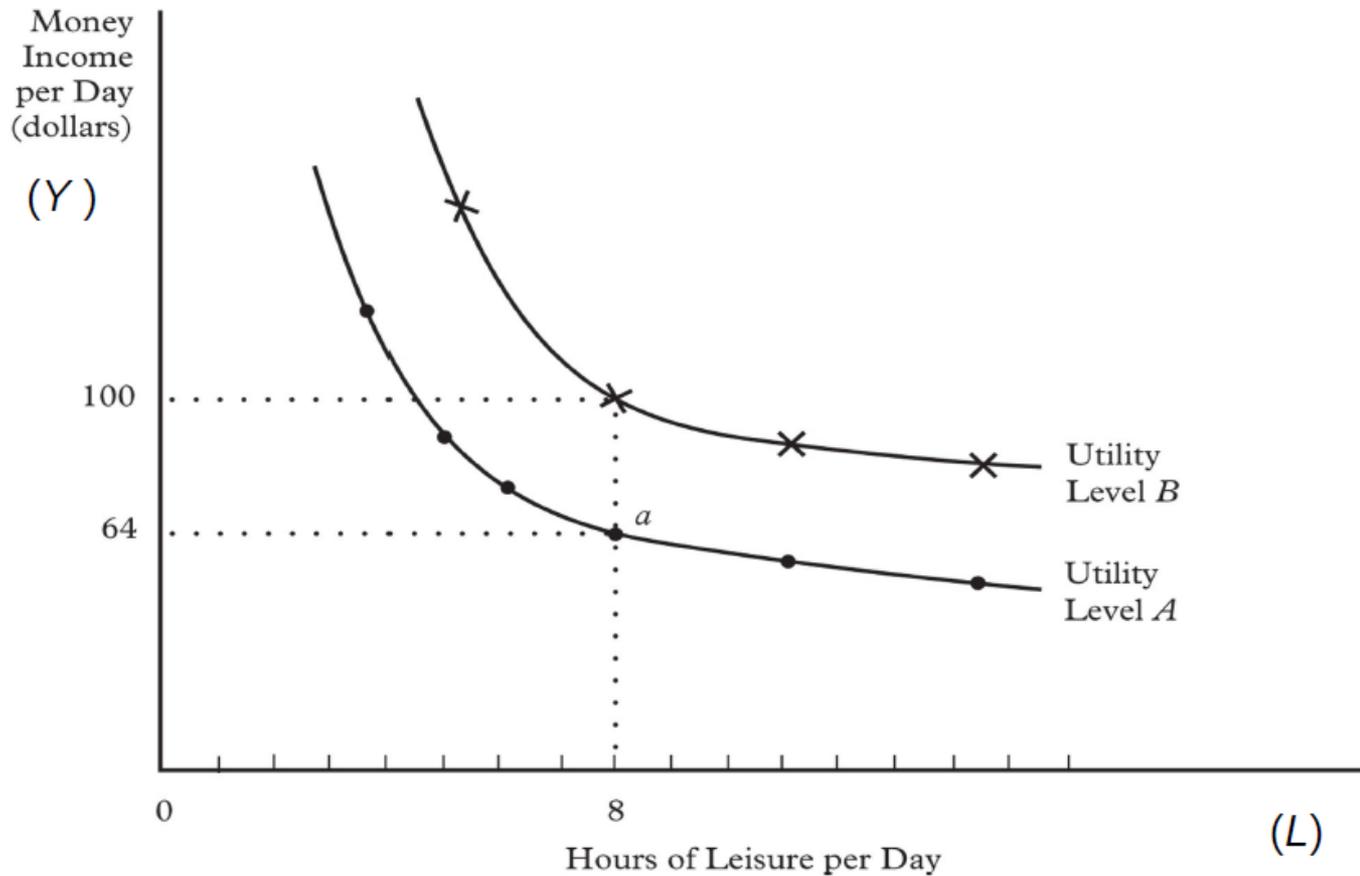
A Theory of the Decision to Work

Figure 6.3   An Indifference Curve
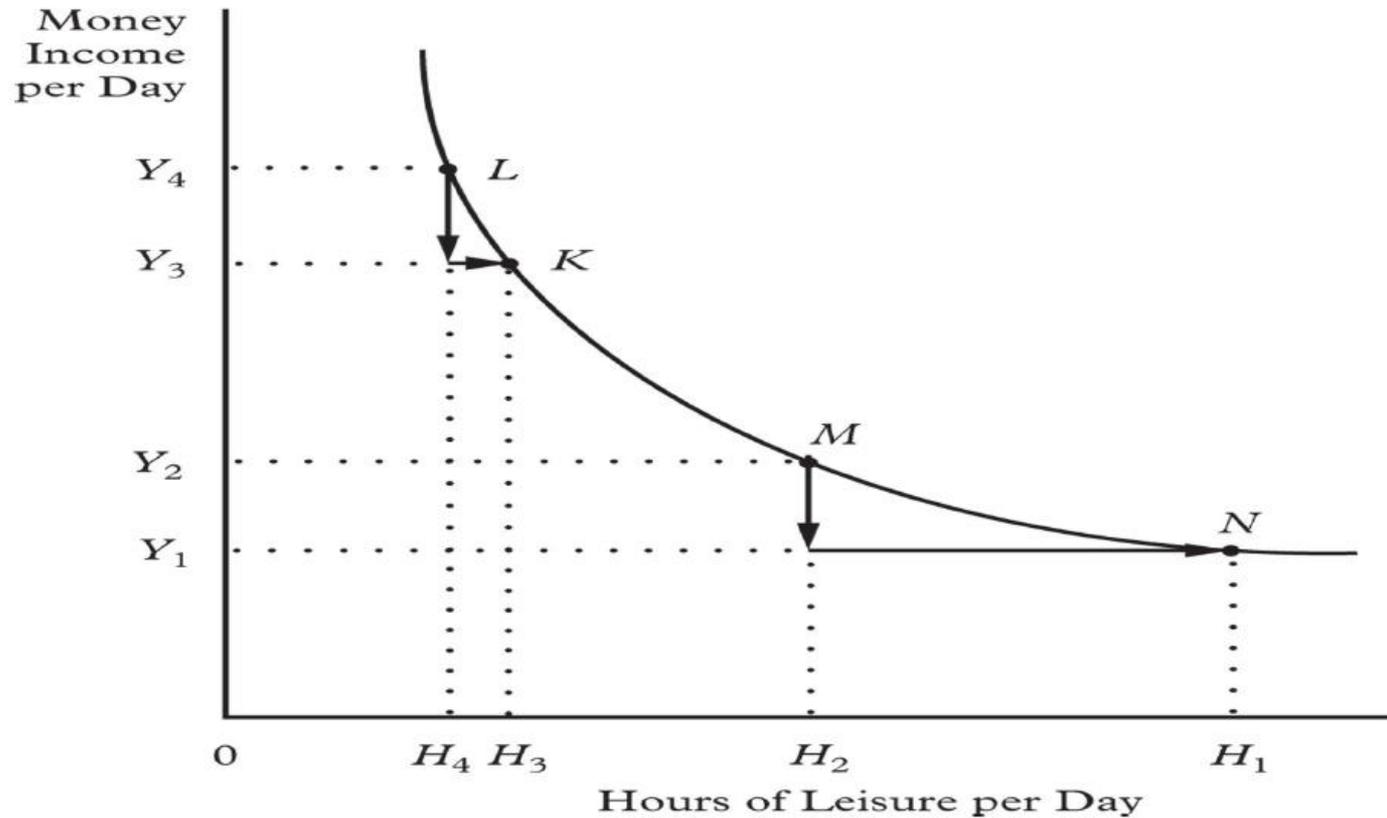
A Theory of the Decision to Work

Figure 6.4 Indifference Curves for Two Different People

A Theory of the Decision to Work

Income and Wage Constraints

- budget constraints show the combinations of money income (or attainable consumption goods and services) and the hours of leisure per day that are possible or attainable for the individual
- for simplification:
  - V = nonlabour income (property income, inheritances, lottery winnings, dividends,)
  - H = number of hours allocated to the labor market
  - w = hourly wage rate
  - L = hours of leisure per day
  - Y = total income defined as: $Y = wH + V$
  - $Y = wH$ (if nonlabour income is zero, that is $V = 0$)
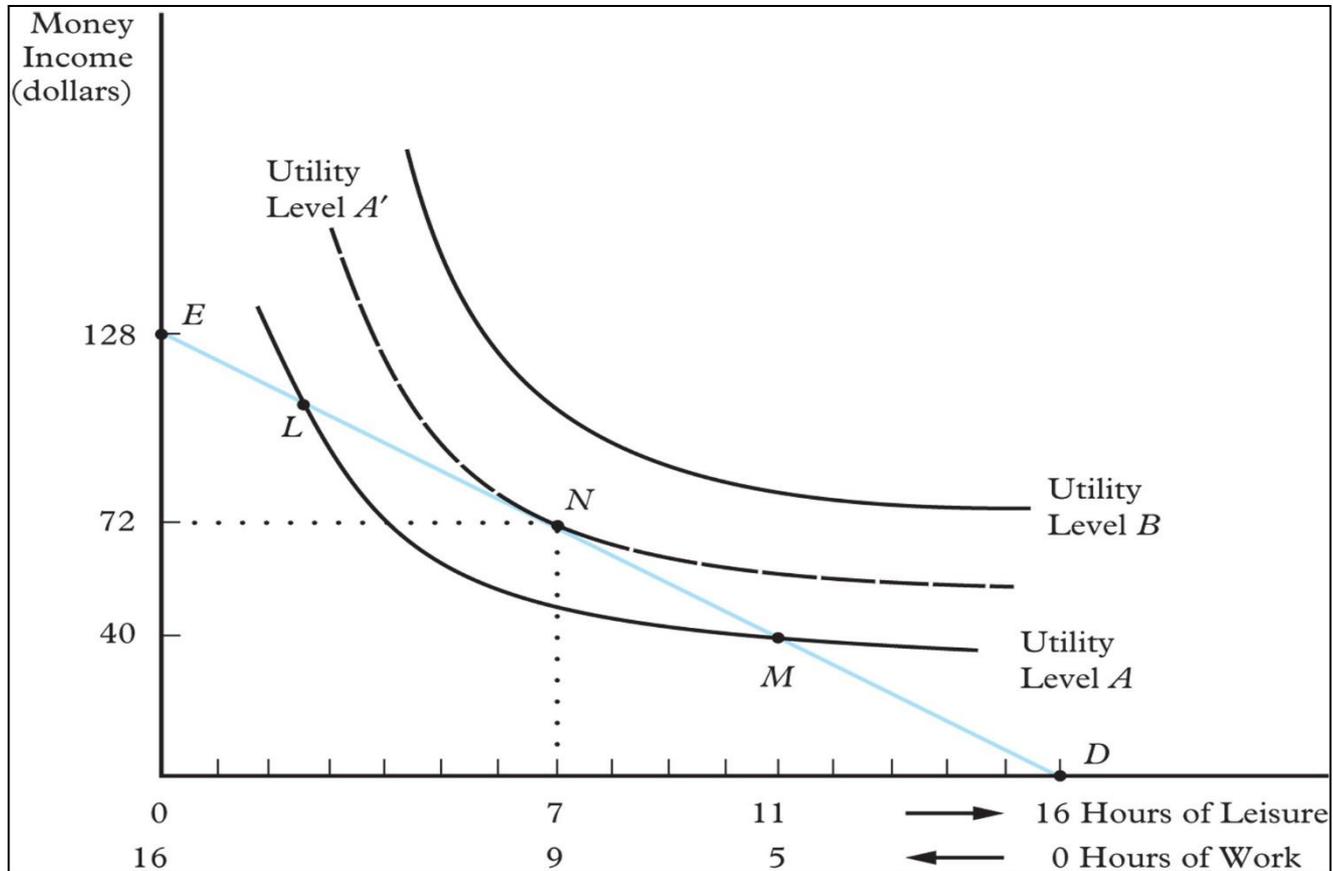 - T = total discretionary time (16 hours) → $T = H + L$

then

$$Y = w(T - L) + V \text{ or } Y = (wT + V) - wL$$

- the slope of the constraint can be expressed as:

$$\frac{\Delta Y}{\Delta L} = -w \qquad \frac{\Delta Y}{\Delta H} = w \qquad \text{wage rate} = \frac{\Delta Y}{\Delta H}$$
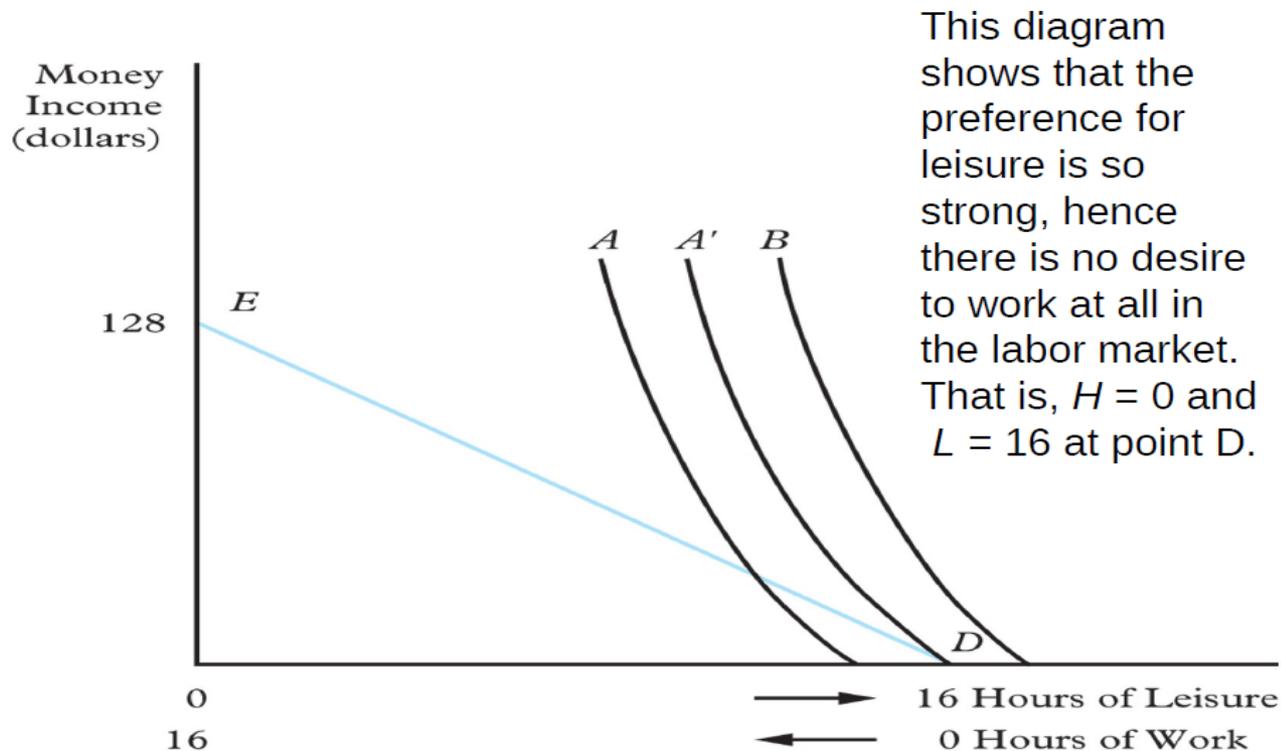
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The optimum

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The optimum: If the preference for leisure is very strong there is no desire to work at all in the labour market – Point *D* with *H = 0* and *L = 16*

Figure 6.6 The Decision Not to Work Is a "Corner Solution"

This diagram shows that the preference for leisure is so strong, hence there is no desire to work at all in the labor market. That is, *H* = 0 and *L* = 16 at point D.
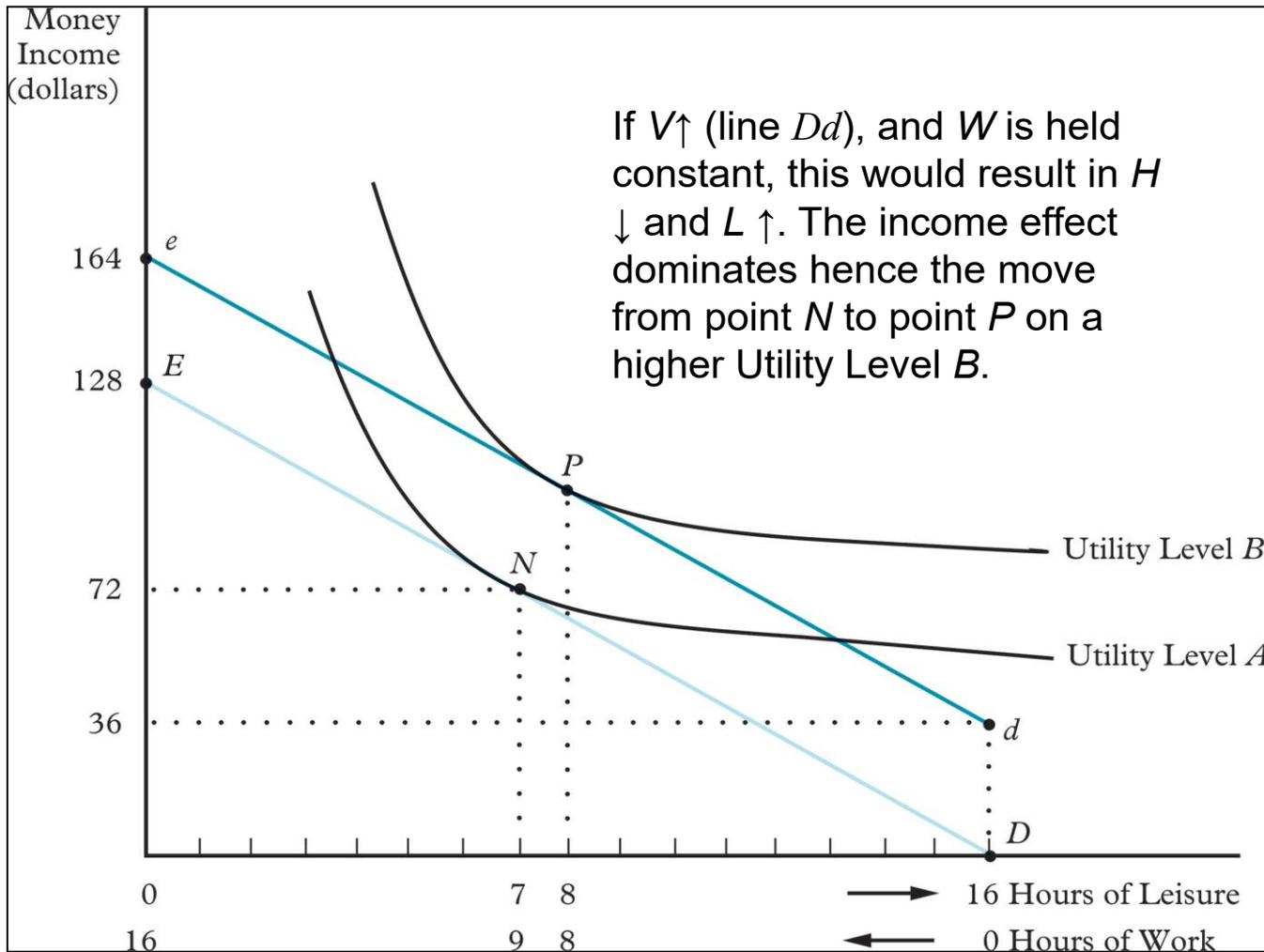
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The Income Effect

- property income, inheritances, lottery prizes, and dividends are nonlabour incomes that shift the budget constraint upward holding the wage rate (W) constant

- an income effect would be observed if nonlabour income increased and the person supplied 0 hours of work to the labour market

- the new source of income (holding the wage rate constant) can cause the worker to supply less hours of work per day and take more hours of leisure

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If $V\uparrow$ (line Dd), and W is held constant, this would result in H ↓ and L ↑. The income effect dominates hence the move from point N to point P on a higher Utility Level B.
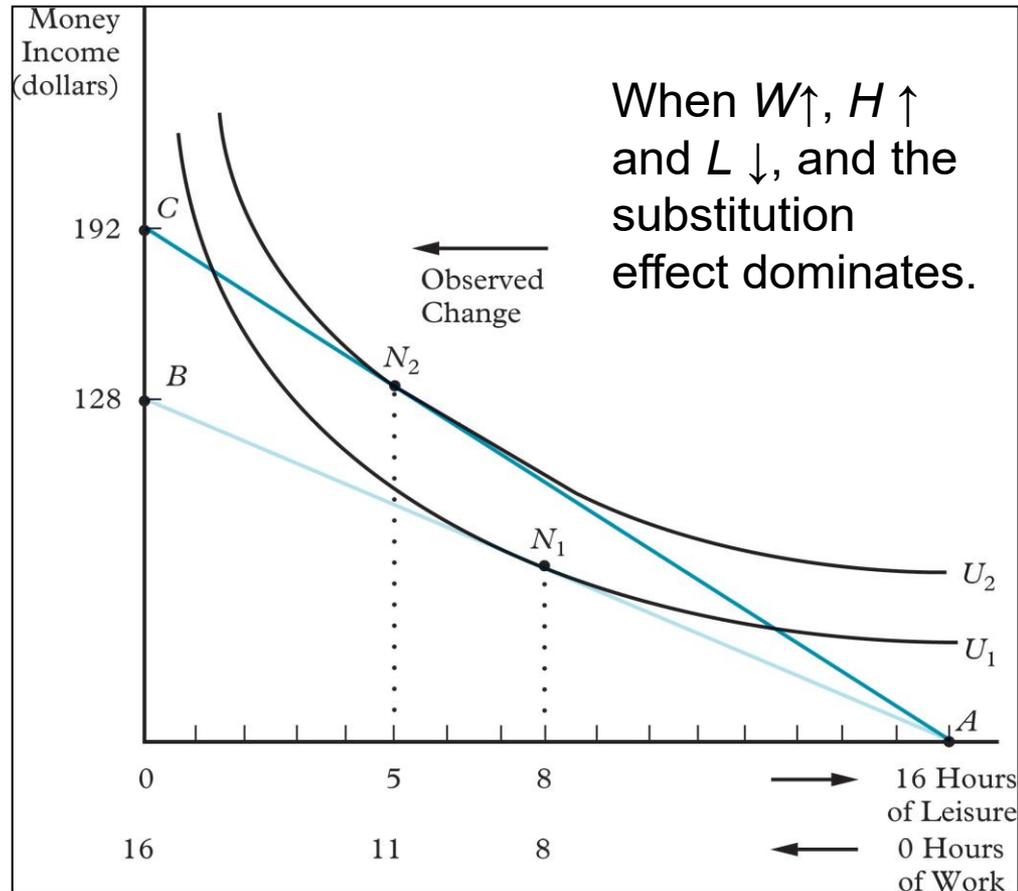
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Income and Substitution Effects with a Wage Increase

- if nonlabour income is zero or unchanged and the wage rate increases ($W\uparrow$), this causes both an income effect and a substitution effect:
  - If worker increases hours of work, then the substitution effect is stronger than the income effect
  - If worker reduces hours of work, then the income effect is stronger than the substitution effect

- the difference between the substitution effect and income effect of a wage increase lies solely in the shape of the indifference curves
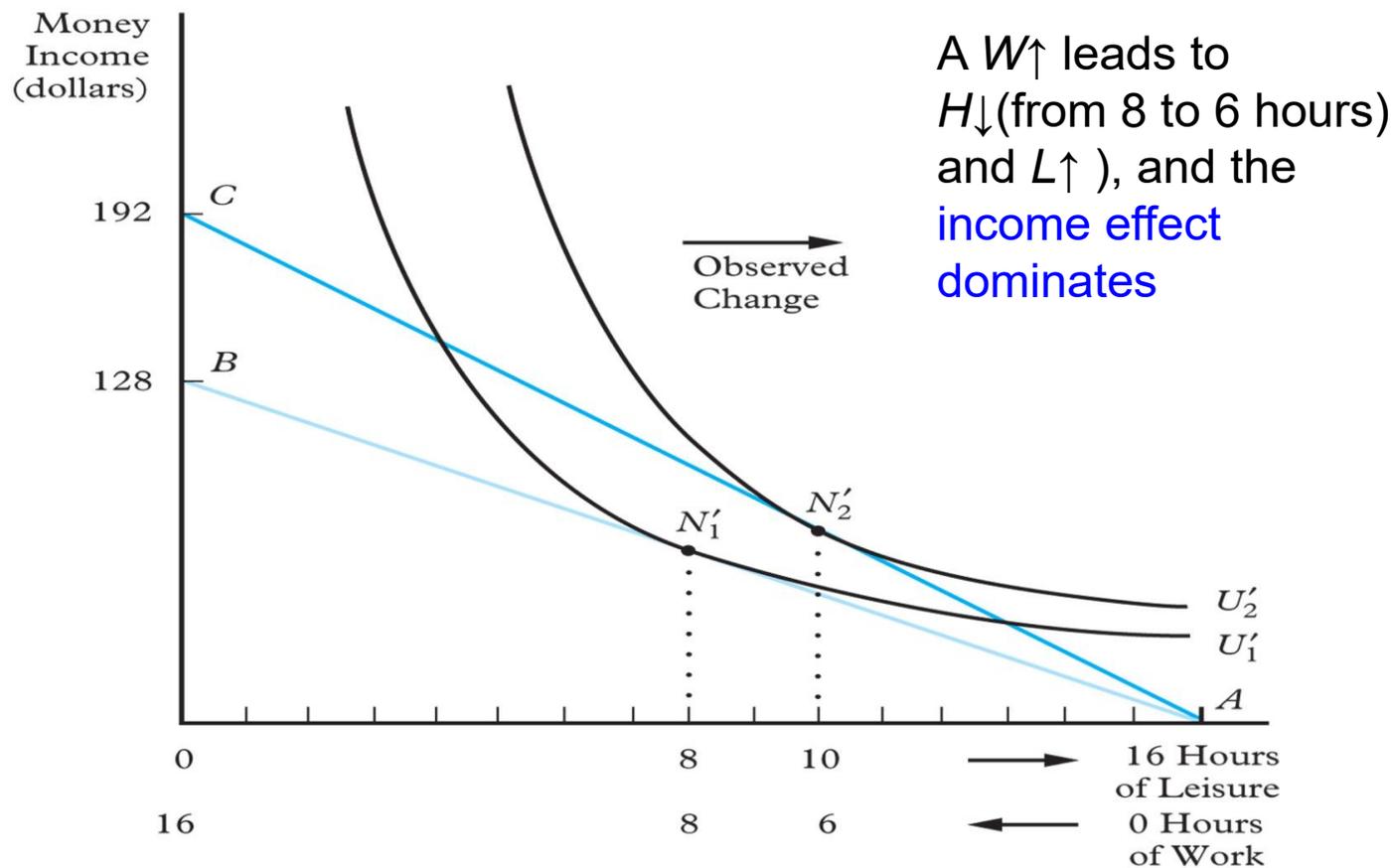
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Wage Increase with Substitution Effect Dominating

When $W\uparrow$, $H \uparrow$ and $L \downarrow$, and the substitution effect dominates.

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Wage Increase with Income Effect Dominating

A $W\uparrow$ leads to $H\downarrow$(from 8 to 6 hours) and $L\uparrow$), and the income effect dominates

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Isolating Income and Substitution Effects

- any given wage increase ($W\uparrow$) can raise a worker's utility level (*e.g.* from U_1 to U_2) and induce:
  - $H\uparrow$ and $L\downarrow \rightarrow$ substitution effect
  - $H\downarrow$ and $L\uparrow \rightarrow$ income effect

- hypothetical question: what would have been the change in labour supply if the worker reached a new (higher) indifference curve with a ΔV instead of a ΔW?
  - the budget constraint will shift northeast parallel to the old budget constraint, holding W constant
  - the worker attains higher level of utility with reduced work hours – associated with greater wealth – at the new point of tangency
  - an $\uparrow W$ (holding wealth constant) causes a worker to end on a higher portion of the same indifferences with $H\uparrow$ and $L\downarrow$

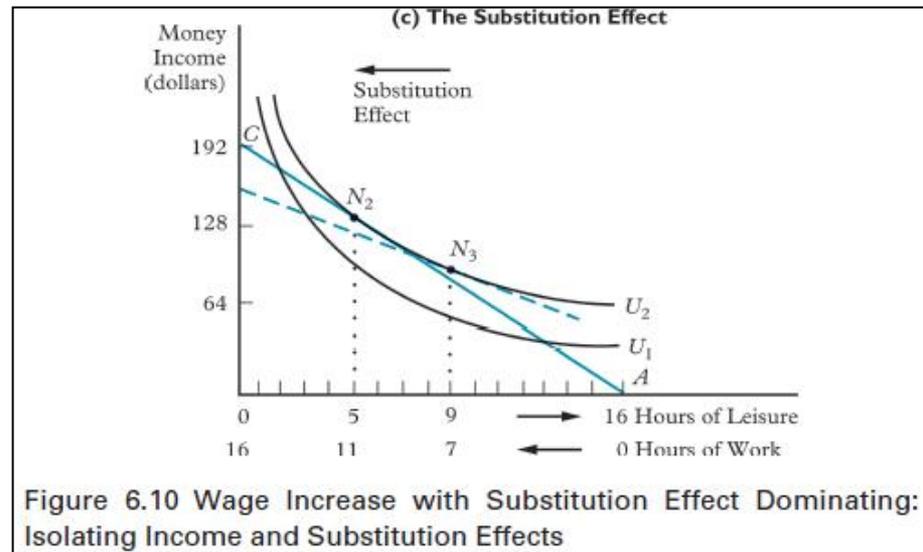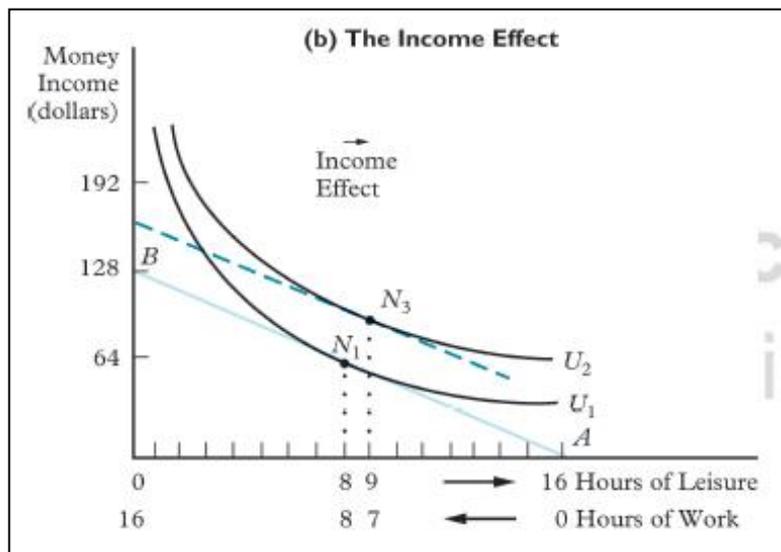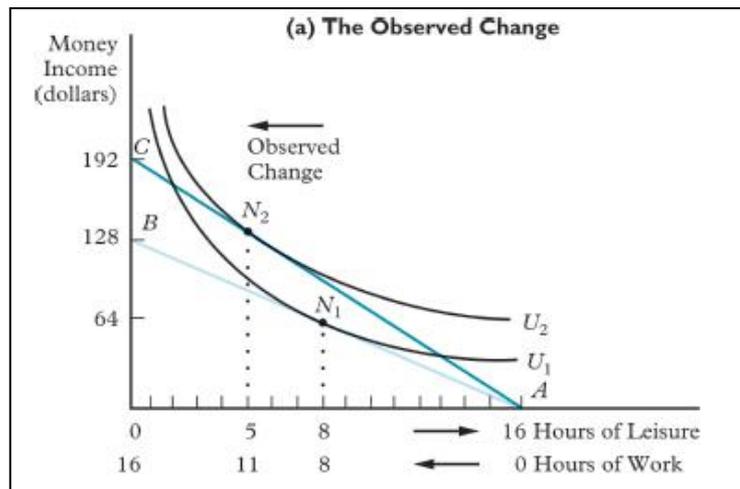# A Theory of the Decision to Work

Figure 6.10 Wage Increase with Substitution Effect Dominating: Isolating Income and Substitution Effects

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Which Effect Is Stronger

- the size of the income and substitution effects of a wage increase depends on the slopes of the indifference curves and the new budget constraints
  - if the worker had a relatively flat set of indifference curves, the initial tangency might imply a relatively heavy work schedule
  - if the person had more steeply sloped indifference curves, the initial tangency might imply that hours at work are fewer

other things equal, people who are working longer hours will exhibit greater income effects when wage rates change

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Which Effect Is Stronger

- for persons that were out of the labour force a wage increase can induce two outcomes:
  - either begin to work for pay or remain out of the labour force - reducing the hours of paid employment is not possible – only substitution effect
- a dominant substitution effect will occur:
  - if a wage increase induces the decision to participate
  - if a wage fall causes someone to drop out of the labour force

the labour force participation decisions brought about by wage changes exhibit a dominant substitution effect

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Figure 6.11 The Size of the Income Effect Is Affected by the Initial Hours of Work
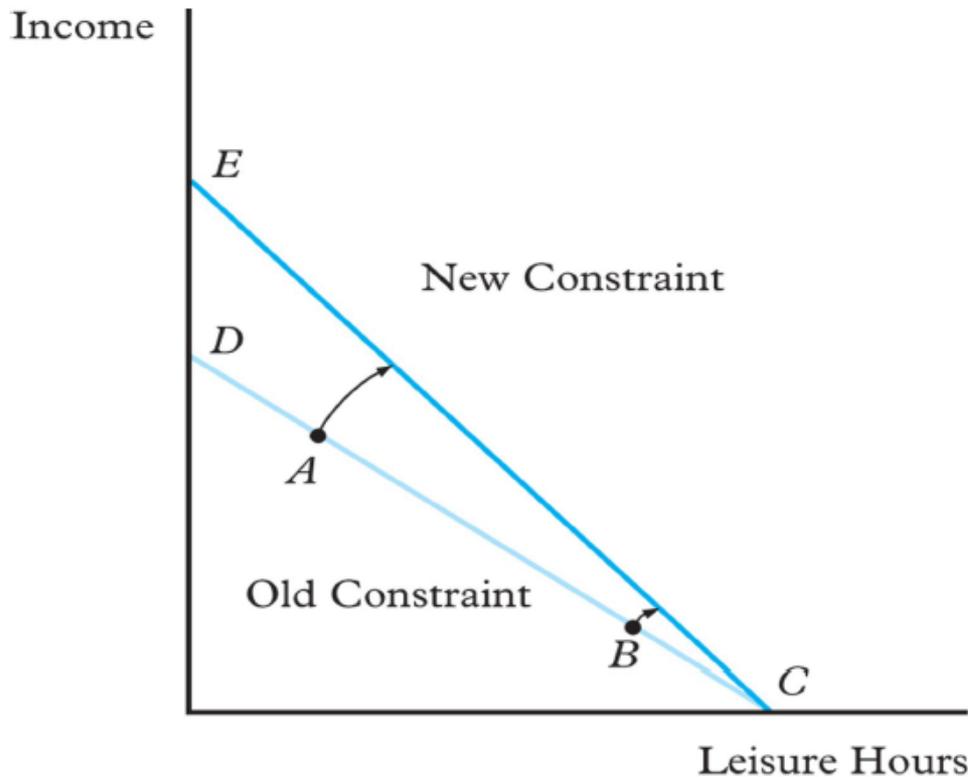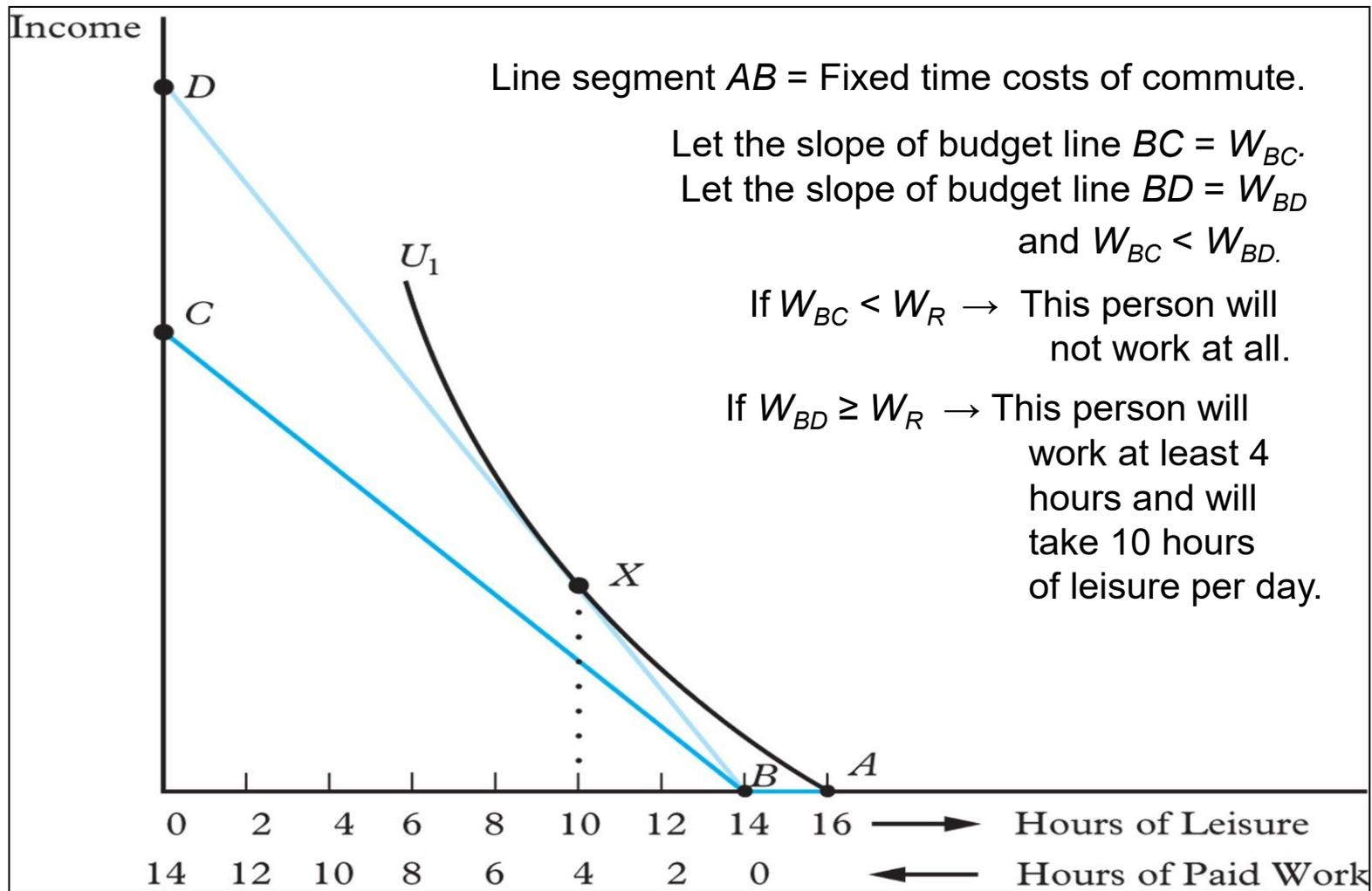

A $W\uparrow$ changes the budget line CD to CE. With flatter U curves, the point of tangency will occur at point A with $H\uparrow$ and $L\downarrow$. With steeper U curves, the point of tangency will occur at point B with less H and more L. Note that a person at point C is not in the labor force because the wage (W_{CD}) – slope of line CD – may be lower than what will induce labor market participation.

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The Reservation Wage

- a worker takes into consideration some key factors in determining whether or not to work:
    - reservation wage and the earning possibilities
    - other factors such as commute time per day (fixed costs of working)

- a reservation wage (W_R) is the wage below which a person will not work in the labour market – W_R represents the value placed on an hour of lost leisure time

- often, people are thought to behave as if they have both a reservation wage and a certain number of work hours that must be offered before they consider to take a job

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Line segment *AB* = Fixed time costs of commute.

Let the slope of budget line *BC* = W_{BC}.
Let the slope of budget line *BD* = W_{BD}
and $W_{BC} < W_{BD}$.

If $W_{BC} < W_R$ → This person will not work at all.

If $W_{BD} \geq W_R$ → This person will work at least 4 hours and will take 10 hours of leisure per day.

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Empirical Findings on the Income and Substitution Effects

- a comprehensive review of numerous studies of the labour supply of men finds that the sizes of the estimated effects vary with both data and the statistical methodology used

- overall, the observed substitution effects are positive while the observed income effects are negative

- studies have found that the labour supply behaviour of women generally has a greater responsiveness to wage changes than that of men