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Economics Education and the Theory of Consumer Choice, Excerpts from Economics Textbook Materials Description of Syllabus and Projector Slides

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Abstract: *Curtis Jr (2018) describes the objective of the university course, to convey intermediate and advanced concepts of consumer choice theory to students using explanatory, graphical and mathematical methods of analysis. The only prerequisite for this course is successful completion of Calculus, Principles of Microeconomics …, or equivalent. After completing the requirements in this course, students should have a sufficient set of skills to thoroughly analyze interesting economic questions and to effectively participate in (i) advanced undergraduate economics courses, (ii) core graduate economic theory courses, and (iii) graduate courses in the school of business, including MBA programs. The emphasis of this paper is that economics is the study of the efficient choices made by individuals, including consumers, workers, owners of firms and social planners … Policy writers, students and wealthy philanthropists reading this paper might conclude that corporate board members, and higher education endowment strategists and budget executives, should focus on and enhance the effectiveness of the individual, conditional on the capacity and constraints, whether they are innate, financial or political.*

Reviewers of this paper include John C Ham, Ph.D. from Princeton University, Full/Tenured Professor & Provost, Advisor; Tenured Professor and Provost; Richard H Steckel, Ph.D. from The University of Chicago, Retired Full/Tenured Professor, Retired Member of the University Faculty Senate, Co-Advisor.Several portions of this paper were originally written and presented by James Edward Curtis Jr. August 21, 2001; 2003; May 13, 2014, and July 31, 2017.

1. INTRODUCTION

Curtis Jr (2018) describes consumer participation in markets based on prices in based on "*Wealth, Prices of market consumption products, and Price-Adjusted Wealth or Real Wealth.*

> When markets are competitive and firms have all the same cost structure, a large number of firms and buyers in the market cause prices to be fixed at the additional cost to providing the good or service because information is fully available on alternative suppliers and customers. Furthermore, free entry and exit price markups, causing market prices to be at equilibrium and markets to be efficient—where voluntary participation in a market-oriented distribution of goods and services maximizes the net gains to producers and consumers.
>
> However, when markets are less competitive, such as monopoly, prices are marked up over the additional cost to providing the good or service, based on consumers' responsiveness to price and the producer's share of the market. This leads to an amount of goods and services, which are bought and sold, that is below the competitive market outcome leading to inefficiencies and additional gains from government regulation. Moreover, when markets are less competitive, producers can price discriminate if they know the willingness and ability of individual consumers to purchase their good and services. While such practices are generally accepted and encouraged for goods such as senior and student movie theater tickets or lunch and dinner restaurant prices, price discrimination based on race is equivalent to statistical discrimination—making predictions about a person based on membership in a certain group (Stockton, 1999, p. 434) and using an individual's membership in a certain group as information on the individual's skill and productivity (Borjas, 2000, p.357). Offering an individual in a racial group a price that is different from a price offered to an individual in another racial group, such as mortgage rate, (holding all other variables constant), constitutes economic discrimination" (Curtis Jr, 2018).

2. THE CLASS DESCRIPTION

The goal of this paper is to provide class materials for studies in consumer economics, intertemporal consumption, and labor supply for individuals, irrespective of grouping, based on business equity/ownership, community/government/social planner responsibilities, education/schooling, ethnicity/race, gender, identity, income/wealth, and region/state/urban dwelling/immigration/migration.

Students should obtain a copy of the required textbook and refer to the recommended textbooks for additional student resources. *Required Textbooks* **(1)** Varian, Hal R. ***Intermediate Microeconomics: A Modern Approach***, Norton: New York, 1999.

Recommended Textbooks **(2)** Frank, Robert H. ***Microeconomics and Behavior***, Boston: McGraw-Hill, 2000; **(3)** Mankiw, N. Gregory, ***Principles of Microeconomics***, Fort Worth: Dryden, 1998; **(4)** Pindyck, Robert S. and Daniel Rubinfield, ***Microeconomics***, Macmillan: Simon & Schuster: New Jersey, 1995; **(5)** Stockman, Alan C. ***Introduction to Microeconomics***, Fort Worth: Dryden, 1999; and **(6)** Varian, Hal R. ***Microeconomic Analysis***, Norton: New York, 1992.

3. THE CLASS MATERIALS

Curtis Jr (2018) presents the teaching materials separately, attached to this document, presented in printed Microsoft Powerpoint slides created by James Edward Curtis Jr (2001) for projector transparency presentation by an instructor, and student study.

The following is the outline of the class materials

I. BUDGET CONSTRAINTS

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Budget Constraint*
  - *Preferences & Axioms*
  - *Optimal Choice & Demand*
    - *Income & Substitution Effects*
    - *Income & Engel Curves*
  - *Applications:*
    - *Labor Supply*
    - *Intertemporal Consumption*

- Axiom 1: Feasibility
  - *The restriction the value of the goods consumed is less than or equal to the consumer's income*
  - *To estimate the feasibility of a potential consumption bundle of goods, we use income or budget constraints*

- Budget constraint notation (example):

b = number of economics textbooks purchased
c = cups of coffee purchased
p_b = market price of economics textbooks ($100)
p_c = market price of cup of coffee ($5)
I = monthly income ($500)

$$\Rightarrow \underset{\text{income}}{I} \geq \underset{\text{value of coffee consumed}}{p_c c} + \underset{\text{value of books consumed}}{p_b b}$$

- *Axiom 1.1: "No wasted resources"*
  - *Assuming no resources are wasted, then:*

$$I = p_c c + p_b b$$

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Budget Constraint*

- The budget constraint depicts the combinations of goods and services you can consume based on market prices and your income
  - *Consumption possibilities frontier*
  - *People often consume less than they desire because most people do not have an unlimited amount of income.*

- Graphing the budget constraint:

$$I = p_c c + p_b b$$

- *Using cups of coffee as the y axis, solve for c:*

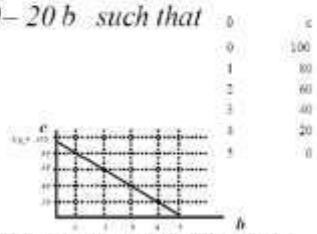
$$p_c c = I - p_b b$$
$$c = (I/p_c) - (p_b/p_c) b \text{ or}$$

- *Plugging in p_c=5, p_b=100 and I=500:*

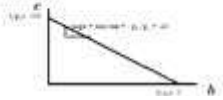
$$c = (500/5) - (100/5) b$$
$$c = 100 - 20 b$$

- Graphing the budget constraint (*con't*):

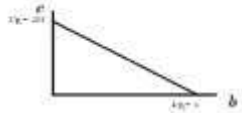
$c = 100 - 20\,b$ such that



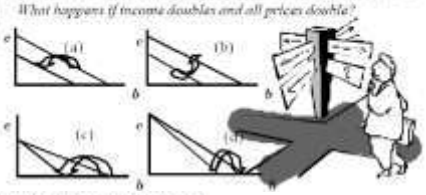
- The slope of the budget constraint equals the relative price of textbooks and coffee
  - *Measures the rate at which the consumer is able trade cups of coffee to consume one additional textbook.*
  - *Measures opportunity costs: based on market prices, you can give up 20 cups of coffee to the purchase one economics textbook*



- The intercepts measure real income
  - *Nominal income (I) measures money income ($500)*
  - *Real income (I/p) measures purchasing power in terms of consumption goods (100 cups of coffee or 5 textbooks)*



- Case Study: Amazon.com vs. OSU Main Bookstore
  1. *What changes are graphs (a)-(d) showing?*
  2. *Explain how new competition from publicly-owned Internet book stores might impact your budget constraint using graphs (a)-(d)?*
  3. *What happens if income doubles and all prices double?*



- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Budget Constraint*
  - *Preferences & Axioms*

II. PREFERENCES AND AXIOMS

- A preference describes how individuals choose to consume one good over another
  - *A preference ordering is a system of ranking all possible combinations of goods in the order of preference*

- Ordinal vs. Cardinal Preference Orderings
  - *An ordinal ranking is a system of ranking preferences that puts bundles of goods in order of most preferred to least preferred*
    - *However, ordinal rankings do not indicate how much one bundle is preferred to another*
  - *A cardinal ranking is a system of ranking preferences by attaching magnitudes or quantifying bundles of goods*
    - *However, different methods lead to different cardinal rankings*

- Utility is used to analyze preferences
  - *Utility is the happiness or satisfaction you obtain from consuming a bundle of goods*
  - *A utility function is a function of consumption goods which is given a number that represents the satisfaction obtained from consuming the goods*
    - *If a set of goods (2 pizzas, 3 coffees) is preferred to another set (1 pizza, 2 coffees), then the satisfaction from consuming (2 pizzas, 3 coffees) is greater than the satisfaction from consuming (1 pizza, 2 coffees)*

- Utility function notation (example):
  - b = *number of economics textbooks purchased*
  - c = *cups of coffee purchased*
  - U = *the utility you obtain from consuming textbooks and coffee*

$\Rightarrow U = U(b,c)$ *or some function of textbooks and coffee*

- *The functional form of the utility function depends on how much you prefer coffee to textbooks or vice versa*

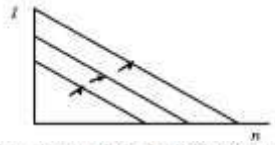
- Example 1: The perfect substitutes utility function
  - l = *number of pencils*
  - n = *number of pens*
  - U = *the utility you obtain from consuming pencils and pens*

$U = U(l, n) = l + n$

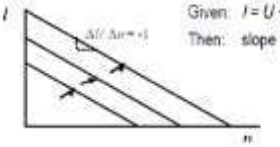
- Graphing the perfect substitutes utility function:
  - $U = l + n$
  - *Using pencils as the y-axis, solve for l:*

$\Rightarrow l = U + (-1)n$ *such that for* $U = 5$, $U = 6$, $U = 7$

- An indifference curve is the graph of the utility function and shows all combos of pencils and pens which provide you the same level of utility, in which you are indifferent
  - *An indifference map is a graphical summation of preference orderings and is a sample of indifference curves that represents the complete set of the indifference curves*



- The slope of the indifference curve, or MRS, is also defined as the (negative) ratio of the marginal utility of pens to the marginal utility of pencils
  - *Marginal utility (MU) is the additional satisfaction obtained from consuming one additional pen (MU_n) or the additional satisfaction obtained from consuming one additional pencil (MU_l)*



- Graphing the perfect complements indifference curve:
  - $U = MIN(l,r)$
  - *Using left shoes as the y-axis, solve for l and r:*

$\Rightarrow U = MIN(l,r)$ *such that for* $U = 5$ $U = 6$ $U = 7$

- Example 3: The strictly convex utility function:
  - z = *slices of Domino's pizza*
  - s = *liters of Mountain Dew soda*
  - U = *the utility you obtain from consuming pizza and soda*

$U = U(z,s) = z^{\frac{1}{2}}s^{\frac{1}{2}}$ *(also known as Cobb-Douglas)*

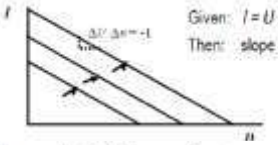
- Example 4: The "bads" utility function:
  - v = *number of anchovies*
  - n = *number of pepperoni slices*
  - U = *the utility you obtain from consuming anchovies and pepperoni slices*

$U = U(v,n) = n - v$

- Example 5: The neutral utility function:
  - c = *pounds of cheese*
  - n = *slices of pepperoni*
  - U = *the utility you obtain from consuming cheese and pepperoni*

$U = U(c,n) = n$

- The slope of the indifference curve equals the rate at which you are willing to give up pencils to consume one more pen
  - *The slope of the indifference curve is the marginal rate of substitution (MRS): You are willing to give up one pencil to obtain one more pen*



- Example 2: The perfect complements utility function:
  - l = *number of left shoes*
  - r = *number of right shoes*
  - U = *the utility you obtain from consuming left shoes and right shoes*

$U = U(l,r) = MIN(l,r)$

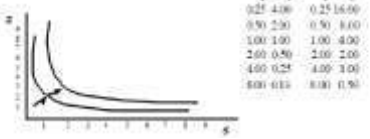
- Example 3: The strictly convex utility function:
  - z = *slices of Domino's pizza*
  - s = *liters of Mountain Dew soda*
  - U = *the utility you obtain from consuming pizza and soda*

$U = U(z,s) = z^{\frac{1}{2}}s^{\frac{1}{2}}$ *(also known as Cobb-Douglas)*

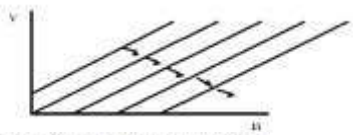
- Graphing the strictly convex indifference curve:
  - $U = z^{\frac{1}{2}}s^{\frac{1}{2}}$
  - *Using slices of Domino's pizza as the y-axis, solve for z:*

$\Rightarrow z^{\frac{1}{2}} = U / s^{\frac{1}{2}}$

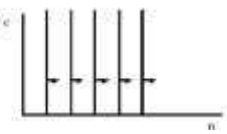
$z = U^2 / s$ *such that for* $U = 1$ $U = 2$



- Graphing the "bads" indifference curve:
  - $U(n,v) = n - v$
  - *Using anchovies as the y-axis, solve for v:*
  - $v = n - U$ *such that*



- Graphing the neutrals indifference curve:
  - $U(c,n) = n$
  - *Using cheese as the y-axis, solve for c:*
  - $0 = n - U$ *such that*



- Example 6: The quasi-linear utility function:

  n = *ironing boards*
  b = *loaves of bread*
  U = *the utility you obtain from consuming salt and bread*

  $U = U(n,b) = n^{1/2} + b$ *[or* $U(n,b) = ln(n) + b$*]*

- Example 7: The strictly concave utility function:

  v = *amount of anchovies consumed*
  c = *scoops of ice cream consumed*
  U = *the utility you obtain from consuming anchovies and ice cream*

  $U = U(z, s) = v^2 + c^2$

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Budget Constraint*
  - *Preferences & Axioms*

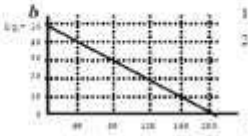
- Axiom 3: Monotonicity (More is better)
  - *As long as people can freely dispose of the pizza and soda they do not want, then more is preferred to less.*
    - *Rules out upward sloping indifference curves, the case where two slices of pizza and two liter of soda might provide you the same satisfaction as one slice of pizza and one liter of soda.*
    - *In terms of indifference curve analysis, Axiom 2 (more is better) implies that indifference curves are downward sloping.*

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics (review):
  - *Budget Constraint*

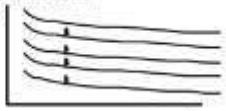
- Graphing the budget constraint:

$b = 50 - \frac{1}{4} c$ *such that*

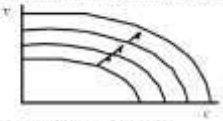
c	b
0	50
40	40
80	30
100	25
120	20
160	10
200	0



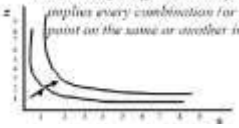
- Graphing the quasi-linear indifference curve:
  - $U(n,b) = n^{1/2} + b$
  - *Using bread as the y-axis, solve for b:*
  - $b = U - n^{1/2}$
    - *An increase in the non-linear good does not increase utility faster than an increase in the linear good after a "sufficient" amount of the non-linear good has been consumed*



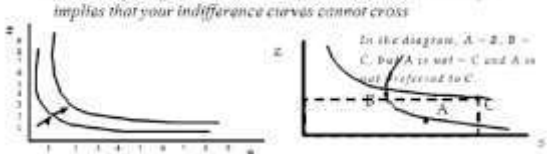
- Graphing the strictly concave indifference curve:
  - $U(n,b) = v^2 + c^2$
  - *Using anchovies as the y-axis, solve for v:*
  - $v = (U - c^2)^{1/2}$
    - *Consumer prefers consuming all anchovies or all ice cream to a combination of the a combination of anchovies and ice cream*



- Axiom 2: Completeness
  - *Consumers are able to rank all possible combinations of pizza and soda:*
    - *Rules out fable of Buridan's (donkey): A hungry animal was unable to choose between two bales of hay in front of it and starved to death*
    - *In terms of indifference analysis, Axiom 2 (completeness) implies every combination (or bundle) of pizza and soda is a point on the same or another indifference curve*



- Axiom 4: Transitivity
  - *If pizza special A is preferred to pizza special B and pizza special B is preferred to pizza special C, then pizza special A is preferred to pizza special C*
    - *Rules out circular flow of preferences*
    - *In terms of indifference curve analysis, Axiom 3 (Transitivity) implies that your indifference curves cannot cross*



- Budget constraint notation (example):

  b = *number of economics textbooks*
  c = *cups of coffee*
  p_b = *market price of used economics textbooks ($20)*
  p_c = *market price of cup of coffee ($2)*
  I = *income ($1000)*

$$\underset{\text{income}}{I} \geq \underset{\text{value of coffee consumed}}{p_c c} + \underset{\text{value of books consumed}}{p_b b}$$

  - *Assuming "no wasted resources" then:*

$$I = p_c c + p_b b$$

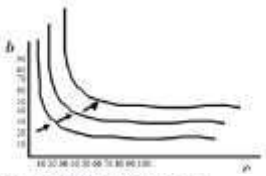
- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics (review):
  - *Budget Constraint*
  - *Preferences & Axioms*

- Example 3: The strictly convex utility function:
  - b = number of textbooks consumed
  - c = cups of coffee consumed
  - U = the utility you obtain from consuming books and coffee

$U = U(b, c) = b^{1/2}c^{1/2}$ (also known as Cobb-Douglas)

- Graphing the strictly convex indifference curve:
  - $U = b^{1/2}c^{1/2}$
  - Using number of textbooks as the y-axis, solve for b:

$\Rightarrow b = U^2 / c$ such that for $U = 40$, $U = 50$, $U = 60$



c	b	c	b	c	b
20	80	20	125	20	180
25	64	25	100	25	144
40	40	40	63	40	90
50	32	50	50	50	72
60	27	60	42	60	60
80	20	80	31	80	45
100	16	100	25	100	36

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Budget Constraint*
  - *Preferences & Axioms*
  - *Optimal Choice & Demand*

III. OPTIMAL CHOICE AND DEMAND

- The optimal choice is the optimal amount of textbooks and coffee that you consume given your preferences and budget constraint
  - *You choose to consume textbooks and cups of coffee to maximize your utility, but your choice is limited by your budget constraint*

- Optimization problem notation (example 1)
  - *Strictly convex preferences:*

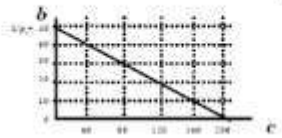
b	= number of economics textbooks consumed (* optimal)
c	= cups of coffee purchased (* optimal)
p_b	= market price of used economics textbooks ($20)
p_c	= market price of cup of coffee ($5)
I	= income ($1000)
U	= the utility you obtain from consuming books & coffee

  - *Choose b^* and c^* to*
    Maximize $U = b^{1/2}c^{1/2}$
    Subject to $I = p_c c + p_b b$

- Graphing the optimization problem (budget):

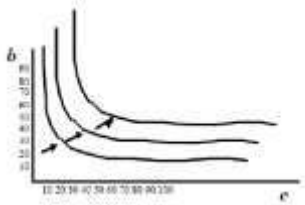
$b = 50 - \frac{1}{4} c$ *such that*

c	b
0	50
40	40
80	30
100	25
120	20
160	10
200	0



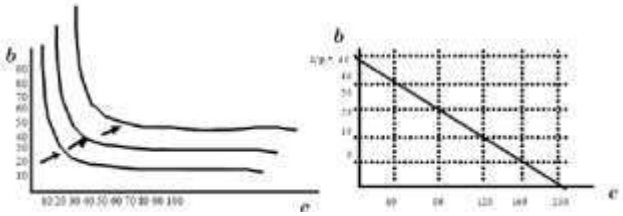
- Graphing the optimization problem (utility):
  - $U = b^{1/2}c^{1/2}$
  - *Using number of textbooks as the y-axis, solve for b:*

$\Rightarrow b = U^2 / c$ *such that for* $U = 40$, $U = 50$, $U = 60$



c	b	c	b	c	b
20	80	20	125	20	180
25	64	25	100	25	141
40	40	40	63	40	90
50	32	50	50	50	72
60	27	60	42	60	60
80	20	80	31	80	45
100	16	100	25	100	36

- Graphing the optimization problem *(con't)*:
  - *Combining utility and budget to obtain the optimal choices of textbooks and coffee*



- Graphing the optimization problem *(con't)*:
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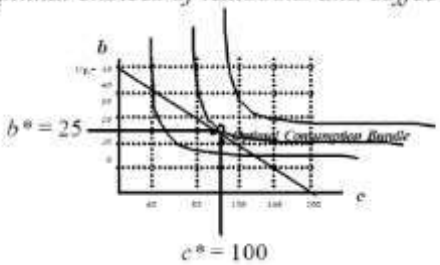
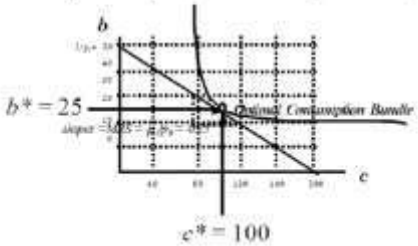


- The solution to the optimization problem
  - *The optimal choice of books and coffee where:*
    - *The budget constraint is tangent to the indifference curve*
    - *The slopes are equal (where MRS = price ratio)*



- The solution to the optimization problem (*con't*)
  - *Slope analysis at 25 textbooks & 100 cups of coffee*
    - *MRS = price ratio (or relative prices) = -0.25:*
    - *You were willing to give up one cup of coffee to obtain one-fourth of a textbook (MRS)*
    - *It cost you one cup of coffee to obtain one-fourth of a textbook, given your income and current market prices (price ratio)*
    - *Interior Solution*

- The solution to the optimization problem (*con't*)
  - *Dollar-spent analysis at 25 textbooks & 100 cups of coffee*
    - *Rearranging MRS = price ratio (0.25):*

$$MU_c / MU_b = p_c / p_b$$
$$MU_c = MU_b (p_c / p_b)$$
$$MU_c / p_c = MU_b / p_b$$

  - *The additional utility from a dollar spent on soda equals the additional utility from a dollar spent on textbooks*
    - *If not, re-adjust consumption to obtain some marginal utility of a dollar spent*

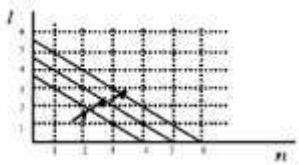
- Optimization problem notation (example 2)
  - *Perfect substitutes (convex preferences):*

l	= number of Buckeye pencil consumed (* optimal)
n	= number of Buckeye pens purchased (* optimal)
p_l	= market price of a Buckeye pencil ($.20)
p_n	= market price of a Buckeye pen ($.25)
I	= income ($100)
U	= the utility you obtain from consuming books & coffee

  - *Choose l^* and n^* to*
    Maximize $U = l + n$
    Subject to $I = p_l l + p_n n$

- Graphing the optimization problem (utility):
  - $U = l + n$
  - *Using pencils as the y-axis, solve for l:*

$\Rightarrow l = U + (-1)n$ *such that for* $U = 4$, $U = 5$, $U = 6$

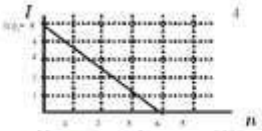


n	l	n	l	n	l
0	4	0	5	0	6
1	3	1	4	1	5
2	2	2	3	2	4
3	1	3	2	3	3
4	0	4	1	4	2
		5	0	5	1

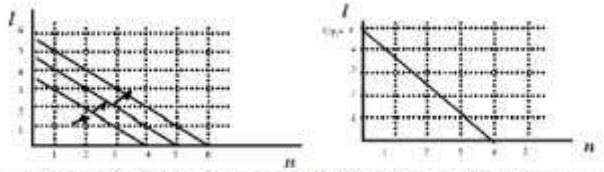
- Graphing the optimization problem (budget):

$l = 5 - (5/4)n$ *such that*

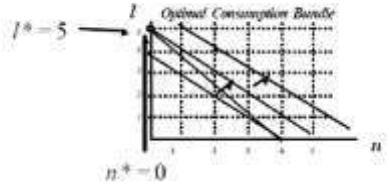
n	l
0	5.00
1	3.75
2	2.50
3	1.25
4	0.00



- Graphing the optimization problem (*con't*):
  - *Combining utility and budget to obtain the optimal choices of Buckeye pens and pencils*



- Graphing the optimization problem (*con't*):
  - *Combining utility and budget to obtain the optimal choices of textbooks and coffee*



- The solution to the optimization problem (*con't*)
  - *Slope analysis at 5 pencils & 0 pens*
    - *MRS (1) < price ratio (-1.25):*
    - *You were willing to give up one pen to obtain one pencil (MRS)*
    - *It cost you one and one-fourth pen to obtain one pencil, given your income and current market prices (price ratio)*
    - *Boundary or corner solution*

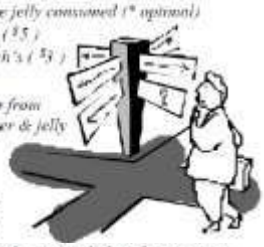
- The solution to the optimization problem (*con't*)
  - *Dollar-spent analysis at 5 pencils & 0 pens*
    - *Rearranging MRS (1.00) < price ratio (1.25):*

$$MU_n / MU_l < p_n / p_l$$
$$MU_n / p_n < MU_l / p_l$$

  - *The additional utility from $1 spent on pens (1.04) is less than the additional utility from $1 spent on pencils (1.05)*
    - *Reducing (increasing) consumption of pens (pencils) does not increase (decrease) the marginal utility of a dollar spent on pens (pencils) due to constant MU_n and already consuming minimum pens (maximum pencils)*

- Case study: Jiffy vs. Welch's
  1. *Solve the following optimization problem.*
  2. *What is the impact on firms in these markets?*

n = jars of Jiffy peanut butter consumed (* optimal)
j = jars of Welch's grape jelly consumed (* optimal)
p_n = market price of Jiffy ($5)
p_j = market price of Welch's ($3)
I = income ($1680)
U = the utility you obtain from consuming peanut butter & jelly



Choose n^* and j^* to
Maximize $U = MIN(j,n)$
Subject to $I = p_n n + p_j j$

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Axioms*
    - *Budget Constraint*
    - *Preferences*
  - *Optimal Choice*
    - *Taxes*
    - *Comparative Static Analysis*
  - *Applications:*
    - *Labor Supply*
    - *Intertemporal Consumption*

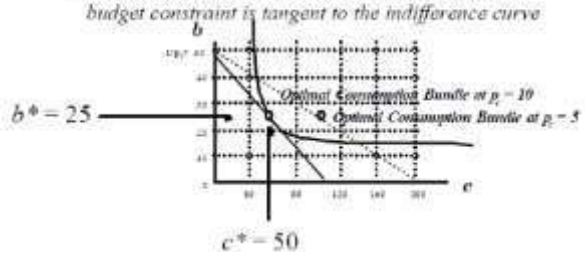
- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics on Optimal Choice
  - *Taxes*

- Reconsider example 1 of the optimization problem
  - *With strictly convex preferences:*

b = number of economics textbooks consumed (* optimal)
c = cups of coffee purchased (* optimal)
p_b = market price of used economics textbooks ($20)
p_c = market price of cup of coffee ($5)
I = income ($1000)
U = the utility you obtain from consuming books & coffee

  - *Choose b^* and c^* to*
    Maximize $U = b^{.5} c^{.5}$
    Subject to $I = p_c c + p_b b$

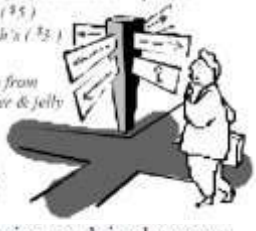
- If the price of coffee increases:
  - *from $5 per cup to $10 per cup,*
    - *The budget constraint pivots inward*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



c = 50*

- Case study: Jiffy vs. Welch's
  1. *Solve the following optimization problem.*
  2. *What is the impact on firms in these markets?*

n = jars of Jiffy peanut butter consumed (* optimal)
j = jars of Welch's grape jelly consumed (* optimal)
p_n = market price of Jiffy ($5)
p_j = market price of Welch's ($3)
I = income ($1680)
U = the utility you obtain from consuming peanut butter & jelly

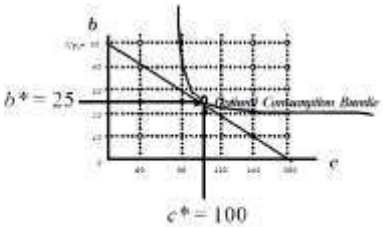


Choose n^* and j^* to
Maximize $U = MIN(j,n)$
Subject to $I = p_n n + p_j j$

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics on Optimal Choice
  - *Taxes*
  - *Comparative Static Analysis*
    - *Price Changes*
      - *Price Consumption & Demand Curves*
      - *Income & Substitution Effects*
    - *Income Changes*
      - *Income Consumption & Engel Curves*

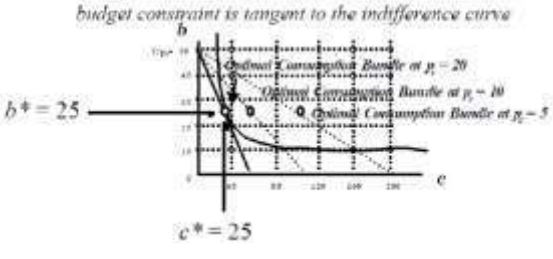
- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics on Optimal Choice
  - *Taxes*
  - *Comparative Static Analysis*
    - *Price Changes*
      - *Price Consumption & Demand Curves*

- The solution to the optimization problem in example 1
  - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



c = 100*

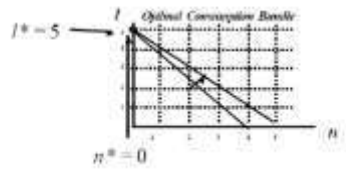
- If the price of coffee increases:
  - *from $5 per cup to $20 per cup,*
    - *The budget constraint pivots inward even more*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



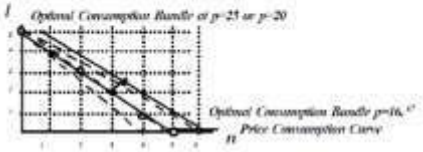
c = 25*

- "Demand" in the consumption goods space
  - *The price-consumption curve, or the price offer curve, traces out the optimal combinations of goods and services demanded at different prices of one good*

- The individual demand curve for coffee, for example, is formed by your optimal choices of coffee at different market prices of coffee, holding your demand and market prices for textbooks and other goods constant
  - *The market demand curve is the sum of individual demand curves*
- The solution to the optimization problem in example 2
  - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*

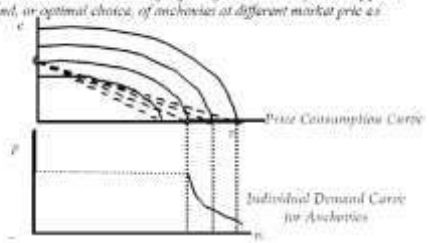


- If the price of Buckeye pens decreases:
  - *from \$25 per cup to \$16.67 per Buckeye pen,*
    - *The budget constraint pivots outward even more*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*

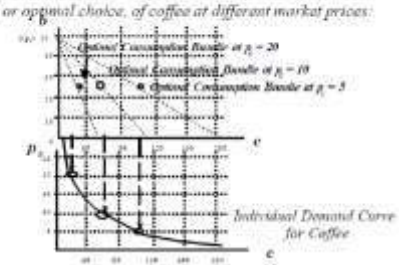


- Demand & Non-Strictly Convex Preferences
  - *If we deviate from strictly convex preferences, we will obtain demand curves that are more difficult to analyze*
    - *Strictly convex preferences produce demand curves with a unique optimal quantity demanded at every price*
    - *Non-strictly convex preferences produce demand curves with more than one optimal quantity demanded at every price*
      - *i.e. perfect substitutes and concave preferences*

- Demand
  - *Your individual demand curve for jars of anchovies is formed by your demand, or optimal choice, of anchovies at different market prices*

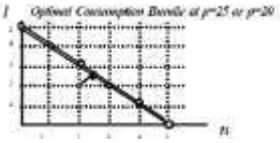


- Demand (in the price-consumption space)
  - *Your individual demand curve for coffee is formed by your demand, or optimal choice, of coffee at different market prices*

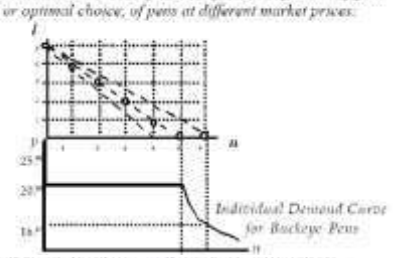


- Reconsider example 2 of the optimization problem
  - *With perfect substitutes:*
    - I = number of Buckeye pencil consumed (* optimal)
    - n = number of Buckeye pens purchased (* optimal)
    - p_I = market price of a Buckeye pencil (=\$20)
    - p_n = market price of a Buckeye pen (=\$25)
    - I = income (=\$100)
    - U = the utility you obtain from consuming books & coffee
  - *Choose I^* and n^* to*
    Maximize $U = I + n$
    Subject to $I = p_I I + p_n n$

- If the price of Buckeye pens decreases:
  - *from \$25 per cup to \$20 per Buckeye pen,*
    - *The budget constraint pivots outward*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



- Demand
  - *Your individual demand curve for Buckeye Pens is formed by your demand, or optimal choice, of pens at different market prices*



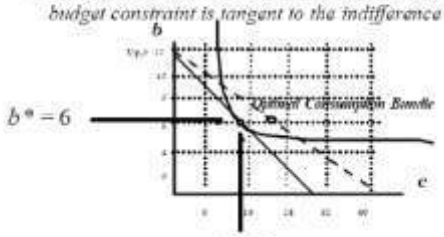
- Consider the following optimization problem
  - *With strictly concave preferences:*
    - v = amount of anchovies consumed
    - c = scoops of ice cream consumed
    - p_v = market price of a jar of anchovies
    - p_c = market price of a scoop of ice cream
    - I = income
    - U = the utility you obtain from consuming anchovies and ice cream
  - *Choose v^* and c^* to*
    Maximize $U = v^2 + c^2$
    Subject to $I = p_v v + p_c c$

- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics on Optimal Choice
  - *Taxes*
  - *Comparative Static Analysis*
    - *Price Changes*
      - *Price Consumption & Demand Curves*
      - *Income & Substitution Effects*

III.i Income and Substitution Effects

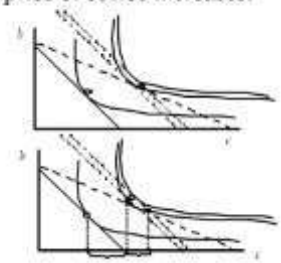
- Reconsider example 1 of the optimization problem
  - *With strictly convex preferences:*
    - b = number of economics textbooks consumed (* optimal)
    - c = cups of coffee purchased (* optimal)
    - p_b = market price of used economics textbooks ($10)
    - p_c = market price of cup of coffee ($ 3)
    - I = income ($120)
    - U = the utility you obtain from consuming books & coffee
  - *Choose b^* and c^* to*
    Maximize $U = b^{1/2} c^{1/2}$
    Subject to $I = p_c c + p_b b$

- If the price of coffee increases:
  - *from $3 per cup to $4 per cup,*
    - *The budget constraint pivots inward*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



$c^* = 15$

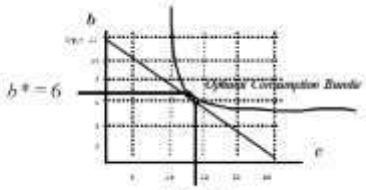
- The total effect of an increase (decrease) in the price of a good leads to a lower (higher) quantity demanded and can be divided up into the following effects:
  - *The substitution effect is the component of the total effect that leads to a new combination of goods consumed because of substitution away from the higher priced good and substitution in a favor of the good with a constant price*
    - *The Hicksian substitution effect shows the quantity demanded and income needed to keep the original utility constant with a change in price*
    - *The Slutsky substitution effect shows the quantity demanded and income needed to afford the original (optimal) choice of consumption goods with a change in price*
  - *The income effect is the component of the total effect that due to a loss in purchasing power (or real income)*
- If the price of coffee increases:



- Reconsider the following optimization problem
  - *Perfect complements*
    - n = jars of Jiffy peanut butter consumed (* optimal)
    - j = jars of Welch's grape jelly consumed (* optimal)
    - p_n = market price of Jiffy ($3)
    - p_j = market price of Welch's ($3)
    - I = income ($1680)
    - U = the utility you obtain from consuming peanut butter & jelly

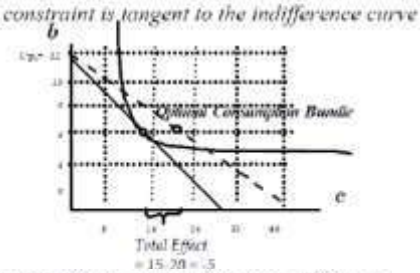
    Choose n^* and j^* to
    Maximize $U = \text{MIN}(j, n)$
    Subject to $I = p_n n + p_j j$

- The solution to the optimization problem in example 1
  - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*

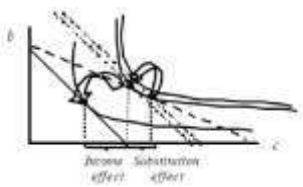


$c^* = 20$

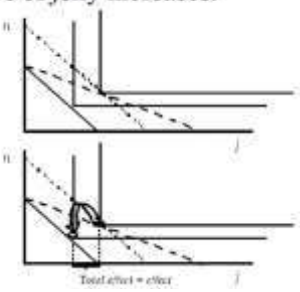
- If the price of coffee increases:
  - *from $3 per cup to $4 per cup,*
    - *The budget constraint pivots inward*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



- To graph the substitution and income effects, consider a hypothetical budget constraint:
  - *Hicksian substitution effect is shown by a tangency to the old indifference curve at the new price ratio*
  - *Slutsky substitution effect is shown by a line through the old optimal consumption bundle at the new price ratio*
  - *Hicks and Slutsky are identical with an infinitesimal (small) changes in price*
- If the price of coffee increases:



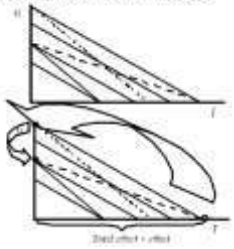
- If the price of jelly increases:



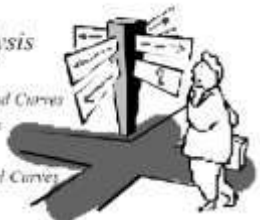
III.ii. Income and Engal Curves

- Reconsider the following optimization problem
  - *Perfect substitutes (convex preferences):*
    - l = number of Buckeye pencil consumed (* optimal)
    - n = number of Buckeye pens purchased (* optimal)
    - p_l = market price of a Buckeye pencil ($20)
    - p_n = market price of a Buckeye pen ($25)
    - I = income ($100)
    - U = the utility you obtain from consuming books & coffee
  - *Choose l^* and n^* to*
    Maximize $U = l + n$
    Subject to $I = p_l l + p_n n$

- If the price of pencils increases:



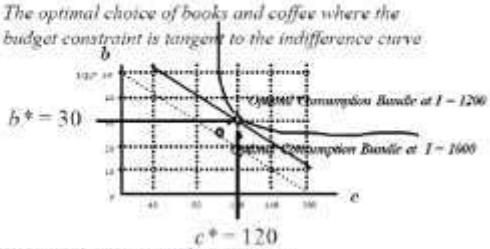
- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics on Optimal Choice
  - *Taxes*
  - *Comparative Static Analysis*
    - *Price Changes*
      - *Price Consumption & Demand Curves*
      - *Income & Substitution Effects*
    - *Income Changes*
      - *Income Consumption & Engal Curves*



IV. APPLICATIONS

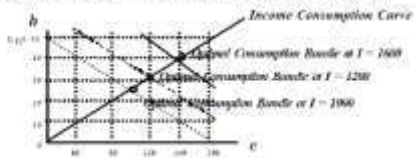
- Reconsider example 1 of the optimization problem
  - *With strictly convex preferences:*
    - b = number of economics textbooks consumed (* optimal)
    - c = cups of coffee purchased (* optimal)
    - p_b = market price of used economics textbooks ($20)
    - p_c = market price of cup of coffee ($5)
    - I = income ($1000)
    - U = the utility you obtain from consuming books & coffee
  - *Choose b^* and c^* to*
    Maximize $U = b^{1/2} c^{1/2}$
    Subject to $I = p_c c + p_b b$

- If your income increases:
  - *from $1000 to $1200,*
    - *The budget constraint shifts outward*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



$c^* = 120$

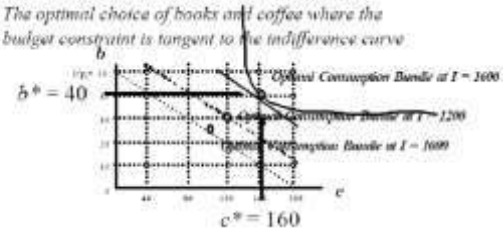
- The income consumption curve
  - *illustrates the combinations of goods and services that are demanded at different levels of income in the consumption good space*
    - *Also income offer curve or income expansion path*



- The solution to the optimization problem in example 1
  - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*

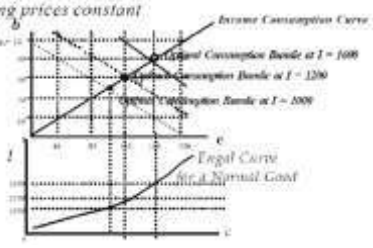
$c^* = 100$

- If your income increases:
  - *from $1000 to $1600,*
    - *The budget constraint shifts outward even more*
    - *The optimal choice of books and coffee where the budget constraint is tangent to the indifference curve*



$c^* = 160$

- The Engal Curve
  - *Illustrates the demand for one good as income changes but holding prices constant*



- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Axioms*
    - *Budget Constraint*
    - *Preferences*
  - *Optimal Choice*
    - *Taxes*
    - *Comparative Static Analysis*
  - *Applications:*
    - *Labor Supply*

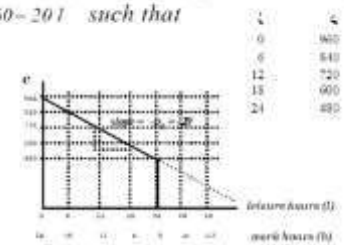
IV.i. Labor Supply

- Theory of consumer choice can be applied to understand how individuals supply their labor to the labor market

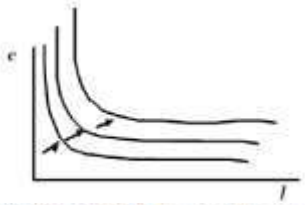
- Optimization problem notation (labor example)
  - *Strictly convex preferences:*
    - l = number of leisure hours (* optimal)
    - h = number of labor hours supplied (* optimal)
    - c = consumption of food, shelter, etc. (* optimal)
    - p_h = market price of labor supplied ($20)
    - p_c = market price of food, shelter, etc. ($1)
    - n = non-labor income ($480)
    - U = the utility you obtain from consuming & working
  - *Choose l^* and c^* to*
    Maximize $U = l^{1/4} c^{3/4}$
    Subject to $p_h h + n = p_c c$

- Graphing the optimization problem (budget):
  - $p_h h + n = p_c c$ where T = time endowment = $h + l$
  - *Using consumption as the y axis, solve for c:*
    $p_c c = p_h (T-l) + n$
    $p_c c = p_h T + n - p_h l$
    $c = (p_h / p_c)T + (1/p_c)n - (p_h / p_c)l$
  - *Plugging in $T=24$, $p_c=1$, $p_h=20$ and $n=480$:*
    $c = (20/1)24 + (1/1)480 - (20/1)l$
    $c = 960 - 20l$

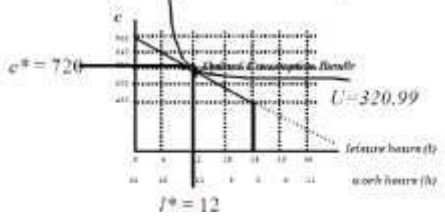
- Graphing the optimization problem (budget):
  - $c = 960 - 20l$ such that



- Graphing the optimization problem (utility):
  - $U = l^{1/4} c^{3/4}$
  - *Using consumption as the y-axis, solve for c:*
    $\Rightarrow c = U^{4/3} / l^{1/3}$

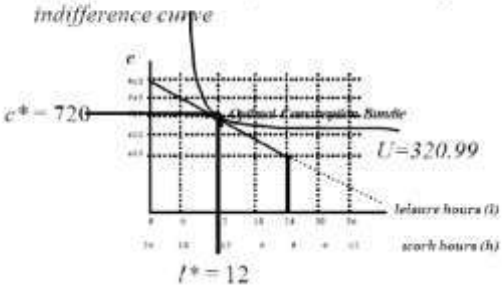


- The solution to the optimization problem
  - *The optimal choice of books and coffee where:*
    - *The budget constraint is tangent to the indifference curve*
    - *The slopes are equal (where MRS = wage)*

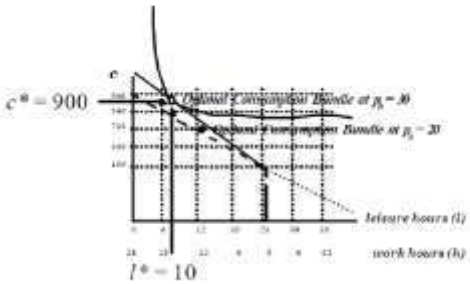


- The individual labor supply curve is equivalent to the individual demand curve.
  - *The labor supply curve is formed by your optimal choices of labor supplied at different market prices (wages), holding your demand and market prices for consumption goods constant*
  - *The market labor supply is the sum of individual labor supply curves*

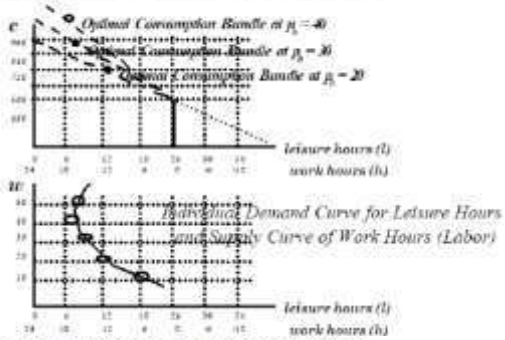
- The solution to the optimization problem
  - *The optimal choice of consumption and labor supplied occurs where the budget constraint is tangent to the indifference curve*



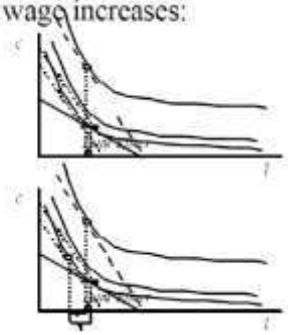
- If wages increase from $20 per hour to $30 per hour, the budget constraint pivots outward



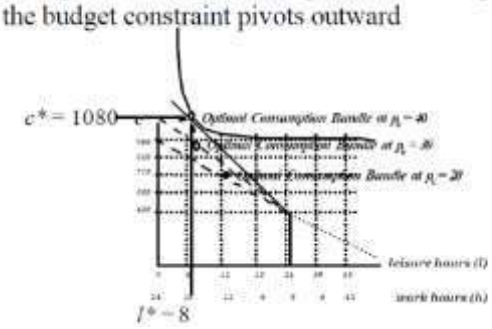
- *Your individual demand and supply curves are formed by your optimal choice consumption and leisure hours at different market prices:*



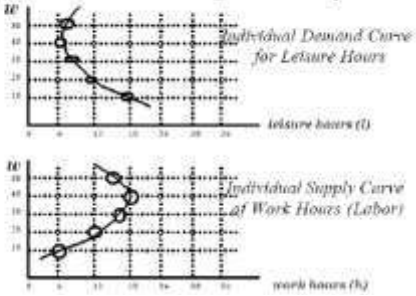
- The total effect of an increase in the wage on leisure demanded (or labor supplied) can be divided up into the following effects:
  - *The substitution effect is the substitution away from (more expensive) leisure in favor of (higher returns to) working with an increase in wages*
    - *The Hicksian substitution effect shows the leisure demanded (or labor supplied) and income needed to keep the original utility constant with a change in wage*
    - *The Slutsky substitution effect shows the leisure demanded (or labor supplied) and income needed to afford the original (optimal) choice of leisure and consumption goods with a change in wages*
  - *The income effect is the increase in nominal income with an increase in wages*
- If the wage increases:



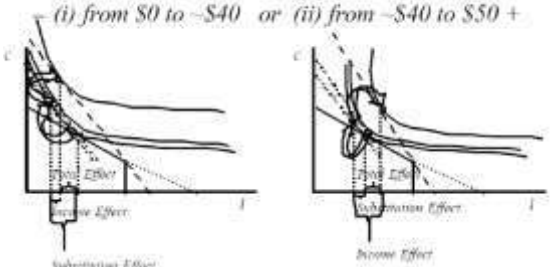
- If wages increase from $20 per hour to $40 per hour, the budget constraint pivots outward



- *Your individual demand and supply curves are formed by your optimal choice consumption and leisure hours at different market prices:*



- To graph the substitution and income effects, consider a hypothetical budget constraint:
  - *Hicksian substitution effect is shown by a tangency to the old indifference curve at the new wage rate*
  - *Slutsky substitution effect is shown by a line through the old optimal consumption bundle at the new wage rates*
  - *Hicks and Slutsky are identical with an infinitesimal (small) changes in wages*
- If the wage increases:
  - *(i) from $0 to –$40 or (ii) from –$40 to $50 +*



- The theory of consumer choice explains how you choose goods & services to consume by analyzing your budget and preferences.
- Lecture Topics:
  - *Axioms*
    - *Budget Constraint*
    - *Preferences*
  - *Optimal Choice*
    - *Taxes*
    - *Comparative Static Analysis*
  - *Applications:*
    - *Labor Supply*
    - *Intertemporal Consumption*

IV.ii. Intertemporal Consumption

- Intertemporal choice analyzes your consumption choices over time subject to your intermporal budget constraint, *i.e.*
  - *Your consumption this period and next period*
    - *Same as the optimal choice of textbooks and coffee*
    - *But now the x-axis might show textbooks purchased this year and the y-axis might show textbooks purchased next year*
  - *Your housing consumption this decade and next decade*
- Future value of the intertemporal budget constraint:
  - *Given:* $I = p_1 c_1 + p_2 c_2$
    $I = p_1 I_1 + p_2 I_2$

    $\Rightarrow p_2 c_2 + p_1 c_1 = [p_1 I_1 + p_2 I_2]$

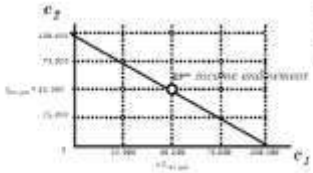
  - *Let:* $p_1 = 1 + r$ *or (net) interest rate r paid next period*
    $p_2 = 1$ *or normalize next period price to $1*

    $\Rightarrow [1+r]c_1 + [1]c_2 = [1+r]I_1 + [1]I_2$
    $\Rightarrow [1+r]c_1 + c_2 = [1+r]I_1 + I_2$
- Optimization problem notation (*intertemporal example*)
  - *Strictly convex preferences:*

    c_1 = amount consumed this period (* optimal)
    c_2 = amount consumed next period (* optimal)
    p_1 = price this period
    p_2 = price next period
    r = market interest rate (P*)
    I_1 = income (endowment) this period ($50,000)
    I_2 = income (endowment) next period ($50,000)
    U = the utility obtained from consuming this period and next period
  - *Choose* c_1^* & c_2^* *to*
    Maximize $U = (c_1)^{1/2}(c_2)^{1/2}$
    Subject to $p_1 c_1 + p_2 h_2 = I$
- Graphing the optimization problem (budget):
  - *Plugging in r=0,* I_1*=50,000, and* I_2*=50,000:*

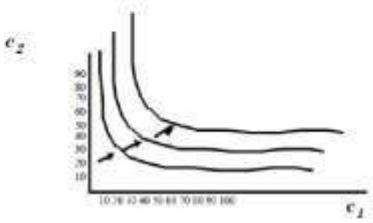
    $c_2 = 50{,}000 + (1+0)[50{,}000 - c_1]$
    $c_2 = 100{,}000 - c_1$ *such that*

c_1	c_2
0	100,000
25,000	75,000
50,000	50,000
75,000	25,000
100,000	0



- Graphing the optimization problem (utility):
  - $U = (c_1)^{1/2}(c_2)^{1/2}$
  - *Using housing next year as the y-axis, solve for b:*
    $\Rightarrow c_2 = U^2 / c_1$ *such that for* $U = 40$, $U = 50$, $U = 60$

c_1	c_2	c_1	c_2	c_1	c_2
20	80	20	125	20	180
25	64	25	100	25	144
40	40	40	63	40	90
50	32	50	50	50	72
60	27	60	42	60	60
80	20	80	31	80	45
100	16	100	25	100	36



- The intertemporal budget constraint
  - *Shows the value of consumption this period plus the value of consumption next period is less than or equal to value of your intertemporal income:* $p_1 c_1 + p_2 c_2 \leq I$
    - *Intertemporal income is value of income endowment this period plus the value of your income endowment next period:*
      $I = p_1 I_1 + p_2 I_2$
    - *The intertemporal budget constraint can written in*
      - *future value notation*
      - *present value notation*
- Present value of the intertemporal budget constraint:
  - *Given:* $I = p_1 c_1 + p_2 c_2$
    $I = p_1 I_1 + p_2 I_2$

    $\Rightarrow p_1 c_1 + p_2 c_2 = [p_1 I_1 + p_2 I_2]$

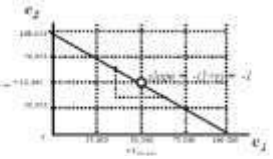
  - *Let:* $p_1 = 1$ *or normalize current period price to $1*
    $p_2 = 1/(1+r)$ *or discount future by the interest rate r*

    $\Rightarrow [1]c_1 + [1/(1+r)]c_2 = [1]I_1 + [1/(1+r)]I_2$
    $\Rightarrow c_1 + [1/(1+r)]c_2 = I_1 + [1/(1+r)]I_2$
- Interpreting the intertemporal budget constraint:
  - *Given:* $c_1 + [1/(1+r)]c_2 = I_1 + [1/(1+r)]I_2$ *(PV)*
    $[1+r]c_1 + c_2 = [1+r]I_1 + I_2$ *(FV)*

    $\Rightarrow c_2 = I_2 + (1+r)[I_1 - c_1]$

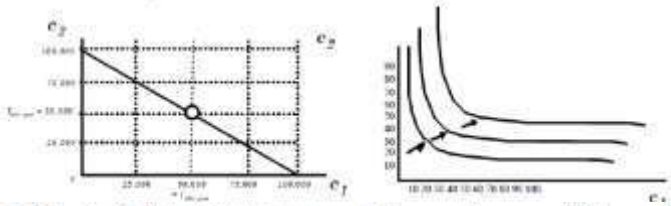
  - *Next period consumption = next period income plus the net return to this period's savings (or income minus consumption)*
- The slope of the intertemporal budget constraint is the (negative) net interest rate

  Given: $h_{\text{next year}} = 100{,}000 - 1\, h_{\text{this year}}$
  - *When the interest rate is zero, it costs one unit housing this period to obtain one additional unit of housing next period*

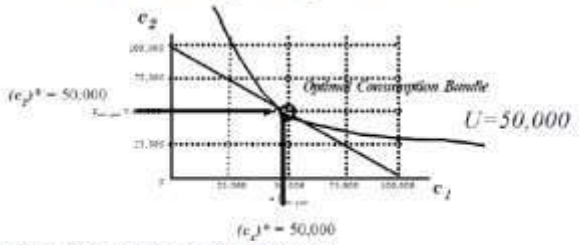


- The slope of the intertemporal indifference curve is the marginal rate of time preference (MRTP)
  - *MRS is slope of atemporal indifference curve*
  - *The willingness to give up one housing unit this year to obtain additional housing units next year*
    - *MRTP = 1 (neutral preferences)*
    - *MRTP > 1 (preferences for future housing)*
    - *MRTP < 1 (preferences for current housing)*

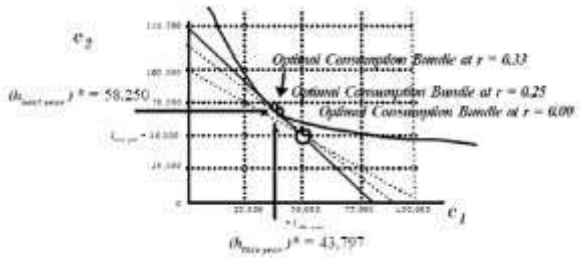
- Graphing the optimization problem *(con't)*:
  - *Combining utility and intertemporal budget to obtain the optimal choices of housing this year and housing next year*



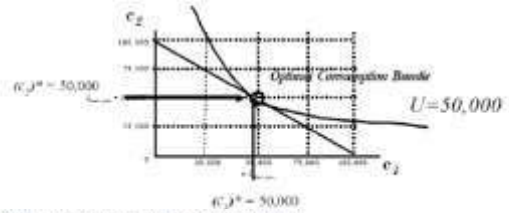
- The individual intertemporal demand curve is formed by your optimal choices of housing this year at different market prices (interest rates), holding your demand for housing next period constant



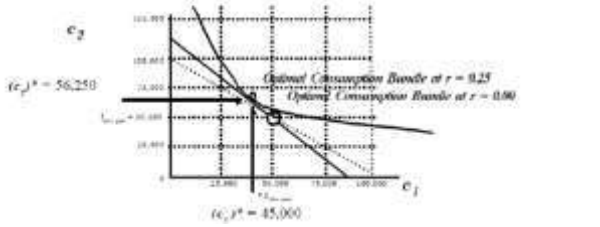
- If the interest rate increases:
  - *from 0 percent to 33 percent,*
    - *The budget constraint pivots clockwise around the endowment point*



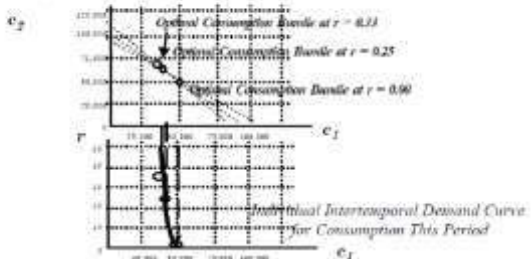
- The solution to the optimization problem occurs where:
  - *The indifference curve is tangent to budget constraint*
  - *The slopes are equal (MRTS = -(1+r))*



- If the interest rate increases:
  - *from 0 percent to 25 percent,*
    - *The budget constraint pivots clockwise around the endowment point*



- Individual intertemporal demand curves:
  - *Formed by your intertemporal demand, or intertemporal optimal choice, of housing this year at different market interest rates*



OTHER ACKNOWLEDGEMENTS

The Closing I believe that it would inappropriate for me to credit anything that I have attained to my family, friends or personal investments in education, professional training or associations. The credit should go to God. In the Old Testament of the Bible, Job (7;17) once asks God, 'What is man that you should set your heart upon him?' If you are also seeking the answer to this question, simply know that "God created man in his own image" (Genesis 1:27). Based on this fact alone, you should have the will to persevere and "Let patience have her perfect work." (James 1:4).

For, I pray that the glory of God manifests itself throughout his kingdom in a manner that achieves his good and perfect will.

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