MACROECONOMICS
73-240

Lecture 5

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This version: September 10, 2019

Announcement

- Because of an event (Intersect at CMU) taking place this Friday
- Section A: (130-250pm) recitation held in TQ 2701.
- Section B: (130-250pm) held in TQ 2612 (no change)
- Section C: (3-420pm) held in TQ 2611 (no change)
- HW 1 due this Friday, please drop off at TQ 2400 before 430pm on Friday Sep 13

Last Class

- We talked about the Household's problem.
- In class, we talked about what assumptions we make about the household
- In particular, we discussed what constraints a HH faced
  - time constraint: $\ell + n = h$
  - budget constraint: $c = w(h - \ell) + \pi - T$

Last Class

- We also represented household preferences with a utility function
  - HH prefers more consumption (and leisure) to less:

$$\frac{dU(c,\ell)}{dc} \geq 0, \quad \frac{dU(c,\ell)}{d\ell} \geq 0$$

  - Each additional unit of c (or ℓ) brings the HH a smaller and smaller gain in utility.
    - In other words, diminishing marginal utility:

$$\frac{d^2U(c,\ell)}{dc^2} < 0, \quad \frac{d^2U(c,\ell)}{d\ell^2} < 0$$

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Quick Recap

- We said the household's objective is to maximize his utility (be as happy as possible!)

$$\max_{c,l} U(c, \ell)$$

- subject to its constraints:

$$c = wn + \pi - T$$

$$h = n + \ell$$

- The household's trade-off:

more ℓ implies less n implies less income to spend on c

Quick Recap

- In solving, we arrive at two optimality conditions that guide the household's choice of c and ℓ:
  - The household always chooses what is affordable (on budget constraint!)
    $$c = w(h - \ell) + \pi - T$$
  - For an interior solution, the household's 'best' way to trade-off c and ℓ is given by:
    $$MRS_{\ell,c} = \frac{U_\ell(c,\ell)}{U_c(c,\ell)} = w$$
    which can be re-arranged to show that optimality requires MB of 1 more unit of ℓ= MC of 1 more unit of ℓ

Corner solutions

Work with the person next to you!

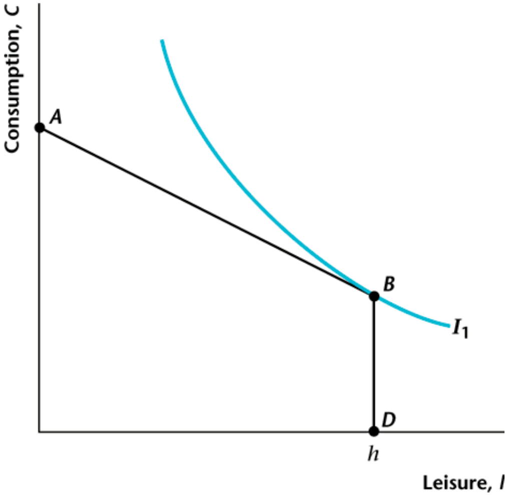
- Suppose the wage rate is equal to 2.
- Draw the household's budget constraint if $\pi - T > 0$. Be sure to write down what is the slope of the budget constaint
- Suppose the household's utility is given by:

$$U(c, \ell) = c + 3\ell$$

- What is the slope of the indifference curve ($MRS_{\ell,c}$)?
- What is the household's optimal choice of consumption and leisure?

[Hint: the title of this slide is helpful]

Choosing Non-employment



- Be careful with corner solutions!!

Income and Substitution Effects

Income and Substitution Effects

Effect of changing parameters of the model (comparative static) can be decomposed in:

Definition

- Income Effect:
  The effect on quantities as a result of having **different income** holding prices constant.

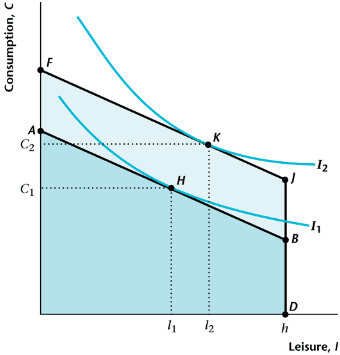
- Substitution Effect:
  The effect on quantities given a price change **holding utility constant**.

Income and Substitution Effects: Examples

- Pure Income Effect: winning the lottery \$1 mn
- When prices change, there can be both income and substitution effects:
  - Substitution Effect Dominates: high wage (\$1 mn) only for 1 day's work
  - Income + Substitution Effect: permanent daily high wage of \$1 mn

Comparative Static: Changing $\pi - T$

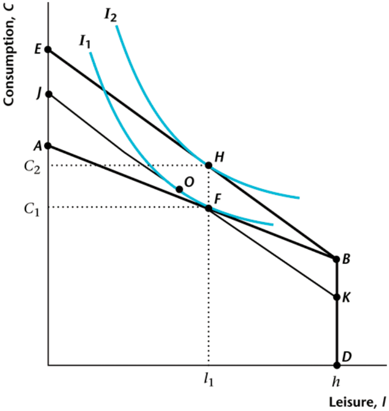
- Suppose $\pi - T$ increases
- If c and l are normal goods
  the richer you are the more you want



- So what happens when you give tax rebates??

Comparative Static: Changing Wages

- Suppose your wage goes up.



- Remember: leisure is more expensive
- In general this case features both income and substitution effects, leisure changes are undetermined.

Discuss amongst yourselves

- Suppose a household initially gains some inheritance I in addition to his/her labor income and dividends less taxes. How does the budget constraint change with I? What about c and ℓ?

- Suppose the government gives a subsidy credit s for each hour the household works. What does the budget constraint look like as $s \uparrow$? What can you say about c and ℓ?

From One to Many Housholds

- We have studied the problem of a single HH.
- Now we want to aggregate (add-up) across HHs.

The Solution: Assumptions

- Key assumptions:
  1. Utility function is homogeneous of degree one.[1]
  2. Households have similar preferences.

[1] Homogeneous function of degree k: if for all $n \in \mathbb{R}$

$$n^k \cdot f(x) = f(n \cdot x)$$

Aggregation

Suppose M number of households in the population. We have:

$$\sum_{i=1}^{M} \max_{c_i, l_i} U_i(c_i, \ell_i) \quad \overbrace{\Rightarrow M \max_{c,\ell} U(c,\ell)}^{\text{Because HHs are identical}} \quad \underbrace{\Rightarrow \max_{c,l} U(\underbrace{M \cdot c}_{C}, \underbrace{M \cdot \ell}_{L})}_{\text{Because U is hod 1}}$$

- $C = M \cdot c$: **aggregate consumption**;
- $L = M \cdot \ell$: **aggregate leisure**.

Aggregation

- Notice that with these assumptions, it is as if we have a single household who optimally chooses C and L
- In Macro, we want to know about aggregate consumption spending C and labor supply $\mathcal{N}^s = (h - \ell) \times M$

- For most of this course: we work with the representative household
- In reality, many different types of households.
- Need to know the weight on each household to add up the decisions of each type to get aggregate consumption and labor supplied.

An example

- There are M households in the population.
- All households have the same preferences:

$$U(c, \ell) = \ln c + \ln \ell$$

- But households differ by their efficiency (effectiveness) at labor.
- 1/2 of the households have labor efficiency e_G, and 1/2 have labor efficiency e_B where $e_G > e_B$.
- A household i is paid a wage w for their effective labor $e_i(h - \ell_i)$, where i can be G or B.
- budget constraint for household i is :

$$c_i = we_i(h - \ell_i) + \pi - T$$

- Does a household of type G choose the same allocations as type B?

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