Econ 301: Microeconomic Analysis

Prof. Jeffrey Naecker

Wesleyan University

Buying and Selling

Motivation

- For most of this class, have assumed that income comes as lump sum
- More recently, introduced idea that income comes from selling goods produced or assets accumulated
- This lecture: take this formulation of endowment income back to the single-consumer optimization problem

Setup

- Consumer starts with *endowment* (ω_1, ω_2)
- *Gross demand* noted by (x_1, x_2)
- Define *net demand* as $(d_1, d_2) = (x_1 - \omega_1, x_2 - \omega_2)$
  - If net demand for a good is negative, consumer is a *net supplier* or *net seller*
- Budget constraint is given by

$$p_1 x_1 + p_2 x_2 = p_1 \omega_1 + p_2 \omega_2$$

- Properties of budget constraint:
  - Goes through
  - Has slope

Setup Graphically

Change in the Endowment

- Suppose the endowment changes to (ω_1', ω_2')
- Three possibilities:
  1. $p_1\omega_1' + p_2\omega_2' < p_1\omega_1 + p_2\omega_2$
  2. $p_1\omega_1' + p_2\omega_2' > p_1\omega_1 + p_2\omega_2$
  3. $p_1\omega_1' + p_2\omega_2' = p_1\omega_1 + p_2\omega_2$

Changes in Endowment

Price Decrease of Good 1

- Suppose p_1 decreases
- What happens to budget line?
- Suppose consumer is net seller of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?
- Suppose consumer is net buyer of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?

Net Seller of Good 1 with Price Decrease

Net Buyer of Good 1 with Price Decrease

Price Increase of Good 1

- Suppose p_1 increases
- What happens to budget line?

- Suppose consumer is net buyer of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?

- Suppose consumer is net seller of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?

Demand Curves

- Gross demand curve is our normal downward sloping demand: $x_1(p_1)$
  - Demand for good 1 depends on p_2 and m but those variables suppressed for now
- At some price p_1^* the consumer switches from net demander to net supplier
- The net demand curve is given by

$$d_1(p_1) = \max\{x_1(p_1) - \omega_1, 0\}$$

- The net supply curve is given by

$$s_1(p_1) = \max\{\omega_1 - x_1(p_1), 0\}$$

Net Supply and Demand Graphically

Slutsky Revisited

- Motivating question: how does demand for a good respond to a change in its price?
  - In previous analysis, had assumed income does not change
  - But now, price changes value of endowment
- We will now have two types of income effects when the price of a good falls:
  - Have already seen *ordinary income effect*, where buying same bundle as before now results in some money left over
  - Now also have *endowment income effect*, since value of endowment is now less

Revamping the Slutsky Equation

- We can write demand as $x_1(p_1, p_2, m(p_1, p_2))$ where $m(p_1, p_2) = p_1\omega_1 + p_2\omega_2$
- Taking the total derivative w.r.t. p_1:

- Note that $\frac{dm}{dp_1} = \omega_1$
- Recall $\frac{\partial x_1}{\partial p_1} = \frac{\partial x_1^s}{\partial p_1} - \frac{\partial x_1}{\partial m}x_1$ from earlier form of Slutsky
- Combining everything, we get

$$\frac{dx_1}{dp_1} = \underbrace{\frac{\partial x_1^s}{\partial p_1}}_{\text{substitution effect}} - \underbrace{\frac{\partial x_1}{\partial m}x_1}_{\text{ordinary income effect}} + \underbrace{\frac{\partial x_1}{\partial m}\omega_1}_{\text{endowment income effect}}$$

Signing the Change in Demand

- Combine terms to get

$$\frac{dx_1}{dp_1} = \frac{\partial x_1^s}{\partial p_1} + (\omega_1 - x_1)\frac{\partial x_1}{\partial m}$$

- What is sign of $\frac{\partial x_1^s}{\partial p_1}$?
- What is sign of $\frac{\partial x_1}{\partial m}$?

- What is sign of $\omega_1 - x_1$?

- Sign of $\frac{dx_1}{dp_1}$ can be summarized like so:

Example: Apples and Oranges

- Suppose a consumer grows apples and oranges in her backyard
- Eats some apples and oranges and sells the rest
- Suppose price of apples goes up
- Is it possible that consumer eats more apples?

Example: Labor Supply

- Consumer has non-labor income M
- Consumer chooses amount of consumption good C, with unit price p
- Consumer also choose labor amount L, with wage w
- Budget constraint?

A More Useful Formulation of Budget Constraint

- Rearrange so choice variables are on left side:
- Add wage times max hours in day $\bar{L}$ to both sides:
- Define $\bar{C} = \frac{M}{p}$ as consumption if spend all non-labor income:
- Define leisure consumption as $R = \bar{L} - L$ and note that $\bar{R} = \bar{L}$:

Budget Constraint Details

- Budget constraint details
  - Goes through
  - Slope
- $\frac{w}{p}$ is the called the *real wage*
  - Since it measures how much consumption good the consumer can purchase if she works one more hour
  - It is also the opportunity cost in consumption units

Budget Constraint Graphically

Comparative Statics of Labor Supply

- Suppose wage w increases. What happens to labor supply?

Backwards-Bending Labor Supply

- First, suppose w is small and consumer barely working
- Does labor supply increas if wage increases?

- Next, suppose w is large and consumer working nearly around the clock
- Does labor supply increas if wage increases?

- This pattern of increasing wage causing increase, then decrease in labor supply is called *backwards bending labor supply*
  - Where it actually bends backwards is empirical question

Labor Supply Graphically