ECON 4905 FALL 2016

- Last Name:
- First Name:
  - Nickname (if any)
- Best way to reach you:
- Class:
- Department:
- Economics Background:
- Math Background:
- Other:
- Relevant Employment:
- Goals:

Outside Money

Lecture 2

Econ 4905, Fall 2016

Outside Money

- Demand by agent *h*

$$x_h = \{x_h^1, ..., x_h^i, ..., x_h^\ell\} > 0, \ x_h \in \mathbb{R}_{++}^\ell$$

- Endowments

$$\omega_h = \{\omega_h^1, ..., \omega_h^i, ..., \omega_h^\ell\} > 0, \ \omega_h \in \mathbb{R}_{++}^\ell$$

- Agents range from $h = 1, ..., n$

Outside Money, Continued: Taxes

- Taxes, in dollars

$$\tau = \{\tau_1, \tau_2, ..., \tau_h, ..., \tau_n\}, \ \tau_h \in \mathbb{R}^n$$

- If $\tau_h > 0$, then Mr. *h* is taxed
- If $\tau_h < 0$, then Mr. *h* is subsidized
- If $\tau_h = 0$, then *h* is neither taxed nor subsidized.

Utility

- Utility: $u_h(x_h)$
- Assume, for simplicity, that $u_h'(x_h) > 0$ and $u_h''(x_h) < 0$.

Prices

- Prices

$$p = \{p^1, ..., p^i, ..., p^\ell\} > 0, \ p \in \mathbb{R}^\ell_{++}$$

- Choose *numeraire*, say $p^1 = 1$.
- Price of money in terms of commodity 1: $p^m \geq 0$

$$P^m = \frac{p^m}{p^1} = p^m \geq 0$$

- Commodity (ex: chocolate) price of money. Notice that money can be worthless, such that $P^m = 0$.

Difference between money and other commodities

- The price of chocolate is always positive because it is desired and in short supply.
- Money is desired only if its price is positive

$$P^m \sim \frac{1}{\text{general price level}}$$

- Suggests indeterminacy of equilibrium
  - Source of some financial instability

Equilibrium

- Supply of goods = demand for goods
- Supply of money = demand for money
- **Mr. h's problem:**

$$(CP)\begin{cases} \max u_h(x_h) \\ \text{subject to} \\ p \cdot x_h = p \cdot \omega_h - P^m \tau_h, \text{ or} \\ p \cdot (x_h - \omega_h) + P^m \tau_h = 0 \end{cases}$$

Equilibrium, Continued

- Budget constraint of *h* expanded: $\sum_{i=1}^{\ell} p^i x_h^i = \sum_{i=1}^{\ell} p^i \omega_h^i - P^m \tau_h$
  - For *h = 1, …, n*

- Let x_h satisfy the CP at prices (p, P^m) for *h = 1,…,n*.
- Then $(p, P^m) \in \mathbb{R}^{\ell}_{++} \times \mathbb{R}_{+}$ and $x \in \mathbb{R}^{\ell \times n}_{++}$ are equilibrium values of the goods when **markets clear**, i.e.

$$\sum_{h=1}^{n} x_h = \sum_{h=1}^{n} \omega_h$$

Bonafide Taxes and Balanced Taxes

- τ is said to be balanced if $\sum_h \tau_h = 0$
- τ is said to be *bonafide* if it allows for some equilibrium with *some* positive price of money, such that $P^m > 0$.
- Why do we call this bonafide?
  - Hint: *bona fide*

Dollar Taxation, Continued

- Summing over budget constraints allows us to conclude that if

$$p \cdot x_h = p \cdot \omega_h - P^m \tau_h = 0$$

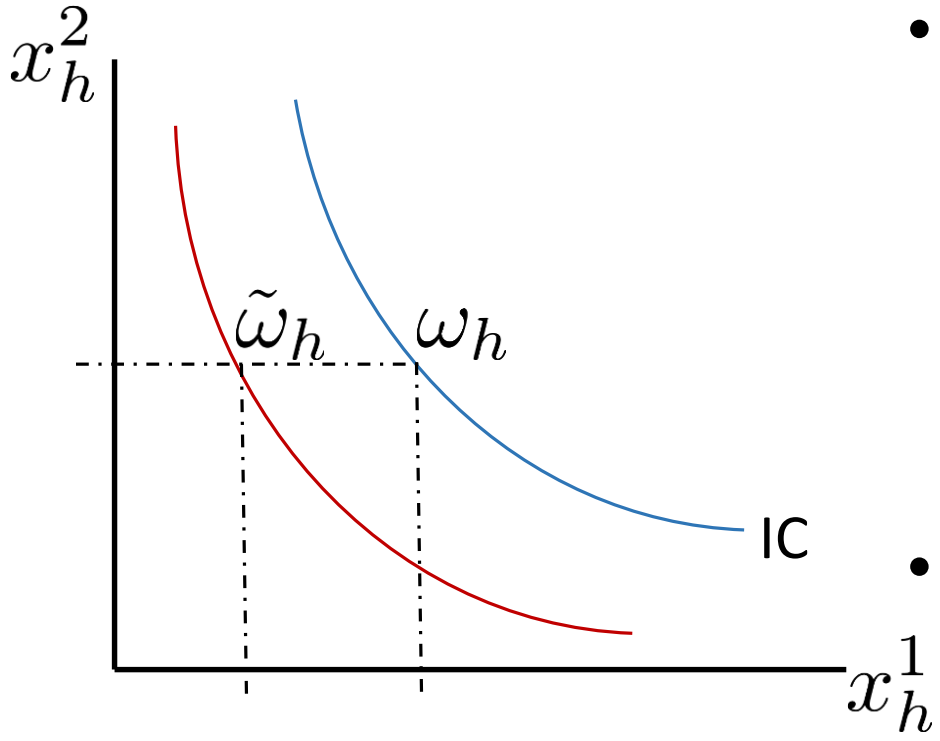
- Then $p \cdot \sum_h x_h = p \cdot \sum_h \omega_h - P^m \sum_h \tau_h = 0$
- In equilibrium $\sum_{h=1}^{n} x_h = \sum_{h=1}^{n} \omega_h$. Hence, $P^m \sum_{h=1}^{n} \tau_h = 0$.
- Therefore, either $P^m = 0$, or $\sum_{h=1}^{n} \tau_h = 0$, or both.

Dollar Taxation, Continued Further

- Hence: an imbalanced tax (i.e. fiscal) policy $(\text{where } \sum_{h=1}^{n} \tau_h \neq 0)$ is not bonafide in finite economies.
- Thus:
  - If taxes are bonafide, then they are also balanced.
- Also true, for finite economies
  - If taxes are balanced, then they are also bonafide.
  - This will be shown in the tax-adjusted simple graphical analysis:

Balanced => Bonafide

- For simplicity, $\ell = 2$ and there are no "corners."



- Define tax-adjusted endowment $\tilde{\omega} = (\omega_h^1, \omega_h^2)$ by

$$\tilde{\omega}_h^1 = \omega_h^1 - P^m \tau_h,$$
$$\tilde{\omega}_h^2 = \omega_h^2$$

- Forget $\tau_h \leq 0$. Focus on $\tau_h > 0$.

Generalization

- Does not require nice indifference curves.
- Can be extended to ℓ commodities
- We will extend the analysis to (finite) dynamic economies with perfect capital (borrowing-lending) markets, where balancedness requires retirement of the public debt (Ricardo)
- Does not extend to the overlapping-generations economy, allowing for rational, non-bursting bubbles.

Some Take-Aways

- The equilibrium P^m is not determinate, and is thus a source of fragility. The price of a paper asset in terms of a real asset or commodity depends on the beliefs of people.
- $P^m = 0$ is always an equilibrium value.

Future Lectures

- Analysis of this lecture extends to finite, dynamic economies.
- Does not extend to overlapping-generations models with infinite horizons, allowing for bubbles.