Econ 201: Introduction to Economic Analysis

October 23 Lecture: General Equilibrium

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Daily dose of The Far Side

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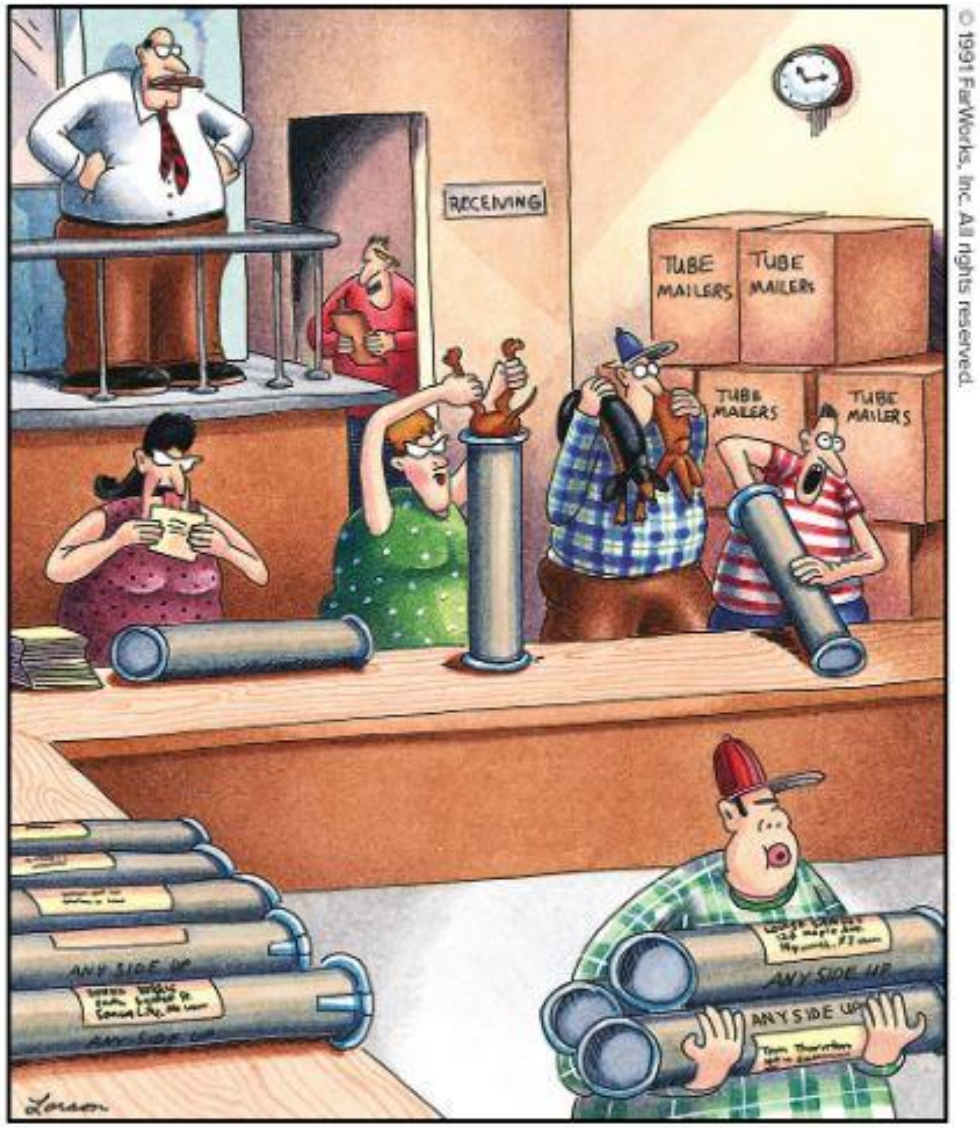


Wiener dog distribution centers

Preview of this class session

- **General-equilibrium** analysis looks at all markets at once
- We consider familiar conditions for efficiency in various markets
  - Efficiency in exchange
  - Efficiency in input use
  - Allocative efficiency
- We show how each of these partial efficiency conditions occurs under perfect competition
- But efficiency does not mean equality

General equilibrium

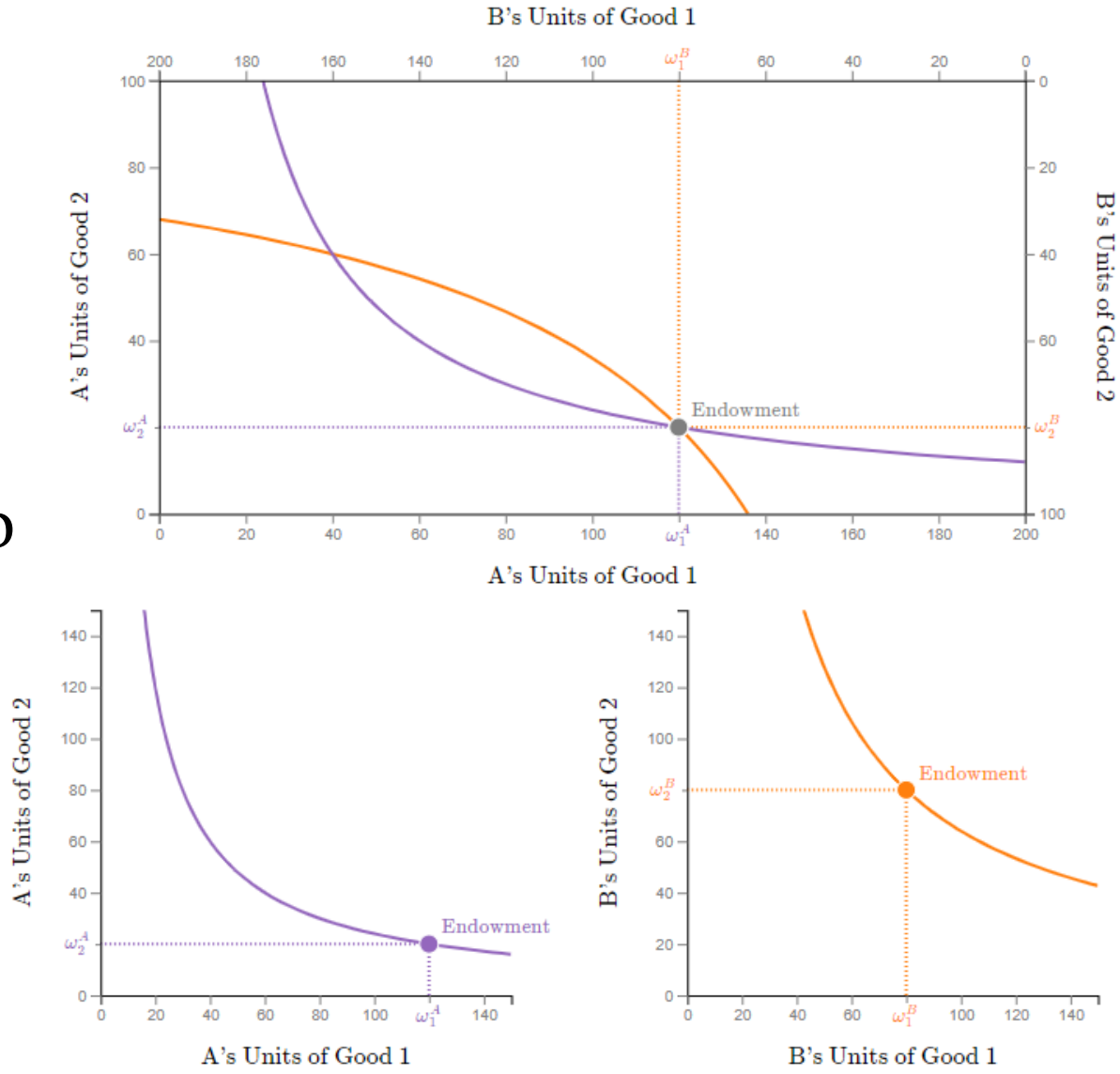
- We have examined **partial equilibrium** in one market at a time
- Markets interact in complex ways
  - Output markets affect input markets: MR → MRP
  - Factor markets affect goods supply curves: W → MC
  - Goods markets affect each other: substitutes and complements
  - Factor markets affect incomes, which affect demand for goods
  - Input markets affect each other through complement/substitute inputs
- What's exogenous?
  - Preferences (psychology) and production technology (engineering)
- Any change initiates complex linkage of effects across economy

Concepts of efficiency

- **Pareto efficiency**
  - No one can be made better off without making someone else worse off
  - No unexploited gains or "free lunches"
  - Not unique: alternative Pareto efficient points where X is rich and Y is poor vs. X is poor and Y is rich
- **Efficiency in exchange**: $MRS^1 = MRS^2$
- **Efficiency in input use**: $MRTS^A = MRTS^B$
- **Allocative efficiency**: $MRS^i = MRT^j$ (= Slope of PPF)
- We show that perfectly competitive price system can achieve all of these conditions

Exchange efficiency: Edgeworth box

- Two consumers: A and B
- Fixed amounts of two goods: 1 and 2
- Each consumer has endowment of 1 and 2: $w_1^A, w_2^A, w_1^B, w_2^B$
- We consider how they can exchange to improve their utility
- Flip B's graph horizontally and vertically so that B's origin is top right
- Stack on top of A's to form box with dimensions $\left(w_1^A + w_1^B\right) \times \left(w_2^A + w_2^B\right)$



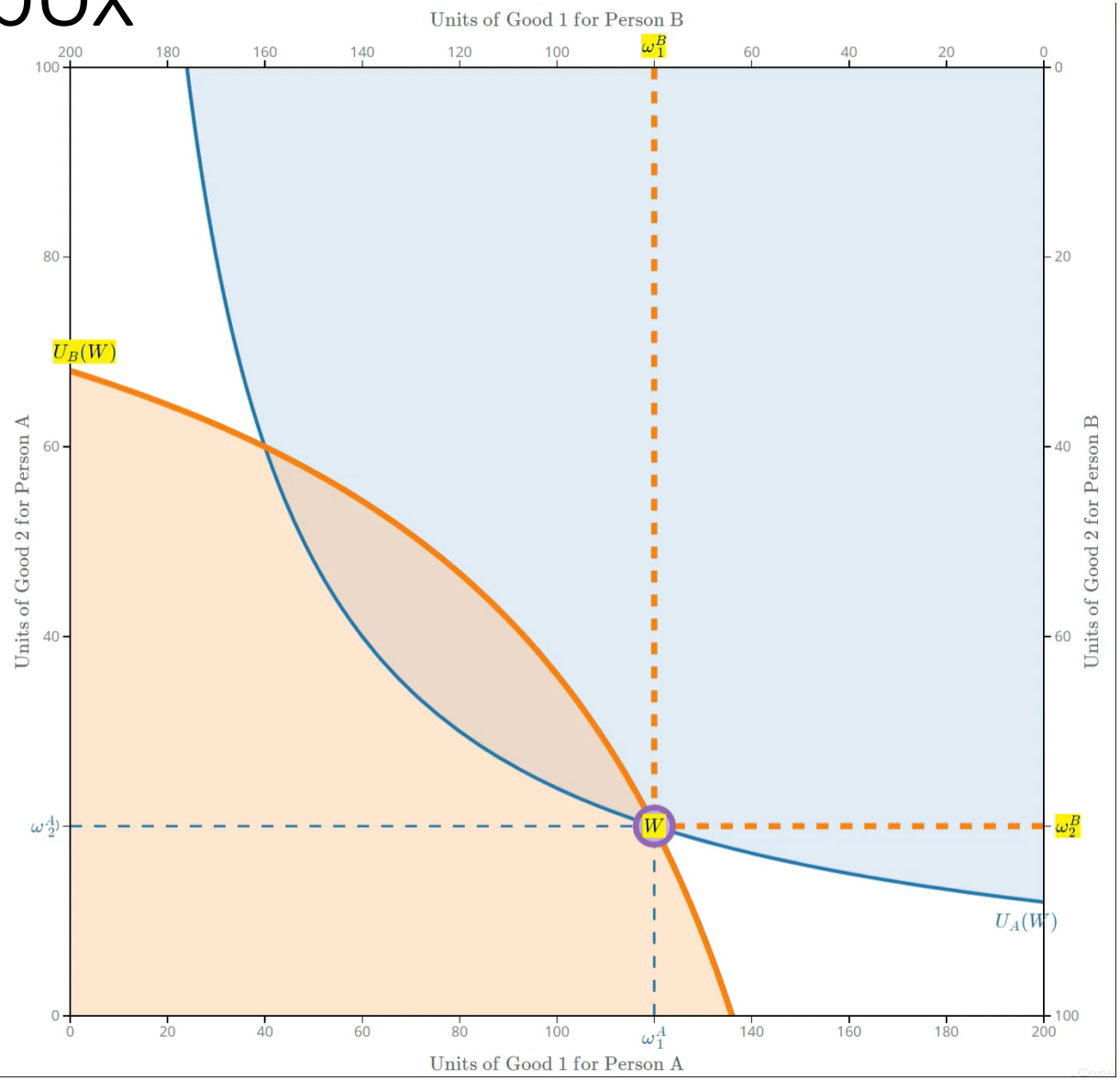
https://www.econgraphs.org/graphs/micro/exchange/edgeworth_box/edgeworth_box_framework

Efficiency in Edgeworth box

- Same graphs as in top panel before

Initial Endowment (W)	Good 1	Good 2
Person A	$\omega_1^A = 120$	$\omega_2^A = 20$
Person B	$\omega_1^B = 80$	$\omega_2^B = 80$

- "**Lens-shaped area**" of mutual improvement
  - Any point in area is Pareto preferred
- **Contract curve** is set of points where A's indifference curve is tangent to B's: exchange efficient



https://www.econgraphs.org/graphs/micro/general_equilibrium/edgeworth_gains_from_trade?textbook=varian

Perfect competition and exchange efficiency

- Each price-taking consumer sets MRS to price ratio, so

$$\text{MRS}_{12}^{A} = \frac{P_1}{P_2} = \text{MRS}_{12}^{B}$$

- By equating everyone's MRS, price system assures exchange efficiency
  - **First theorem of welfare economics**
- Note that each agent's welfare depends on endowment point so efficiency does not imply equity
  - **Second theorem of welfare economics**
  - We can achieve efficient consumption starting from *any* initial endowment
  - In theory, we can analyze efficiency separately from equality issues

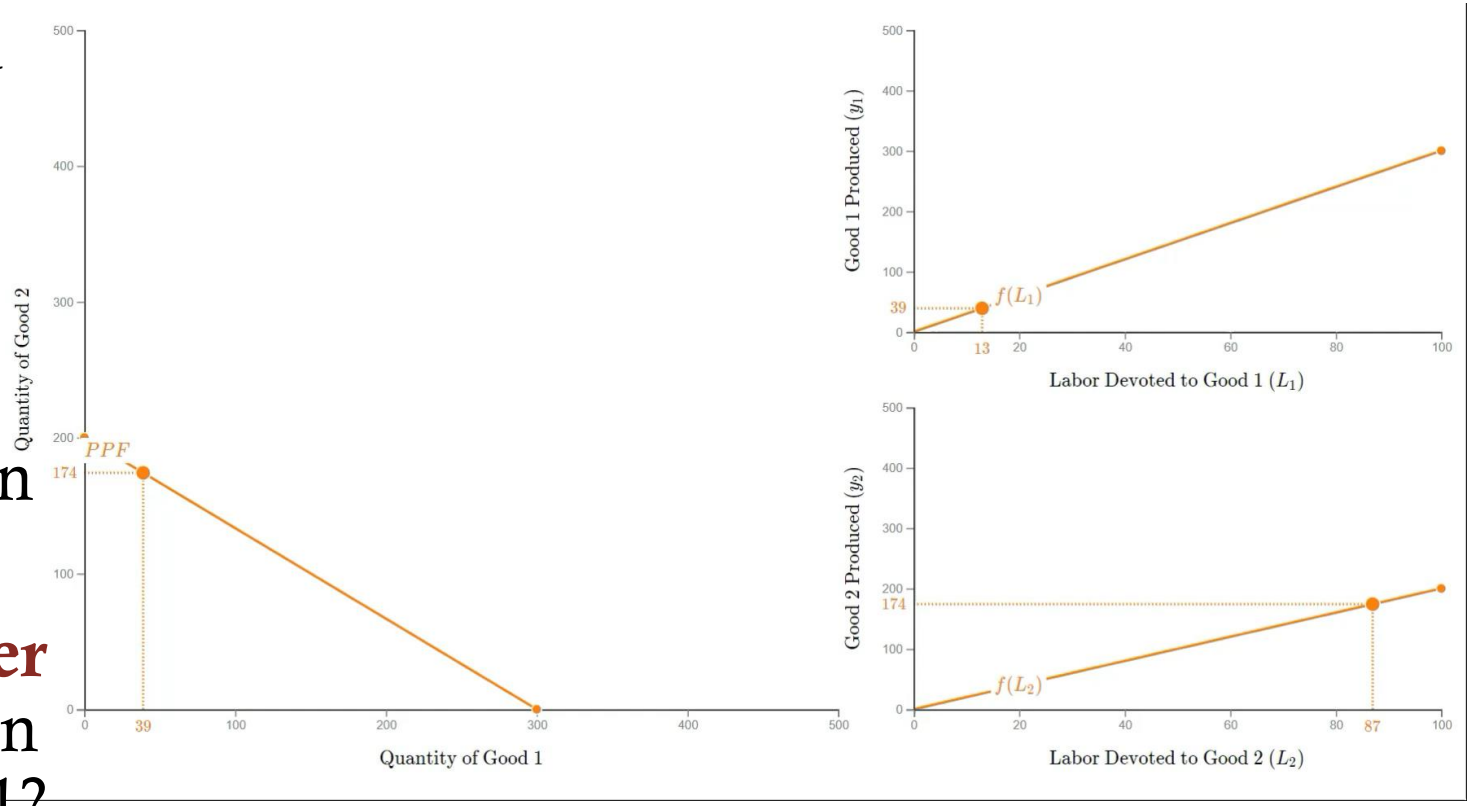
Efficiency of input use

- Can also do in Edgeworth box with fixed allocations of labor and capital for two **producers** A and B of a single good
  - Isoquants look like indifference curves
  - Slope of isoquant = MRTS_{LK}
  - A and B allocate L and K to achieve highest possible production of good
  - Efficiency occurs where isoquants are tangent to one another
- Efficient input use: $\text{MRTS}_{LK}^{A} = \text{MRTS}_{LK}^{B}$
- Perfect competition achieves this because both A and B set MTRS to ratio of input prices:

$$\text{MRTS}_{LK}^{A} = \frac{W}{R} = \text{MRTS}_{LK}^{B}$$

Production-possibilities frontier (linear)

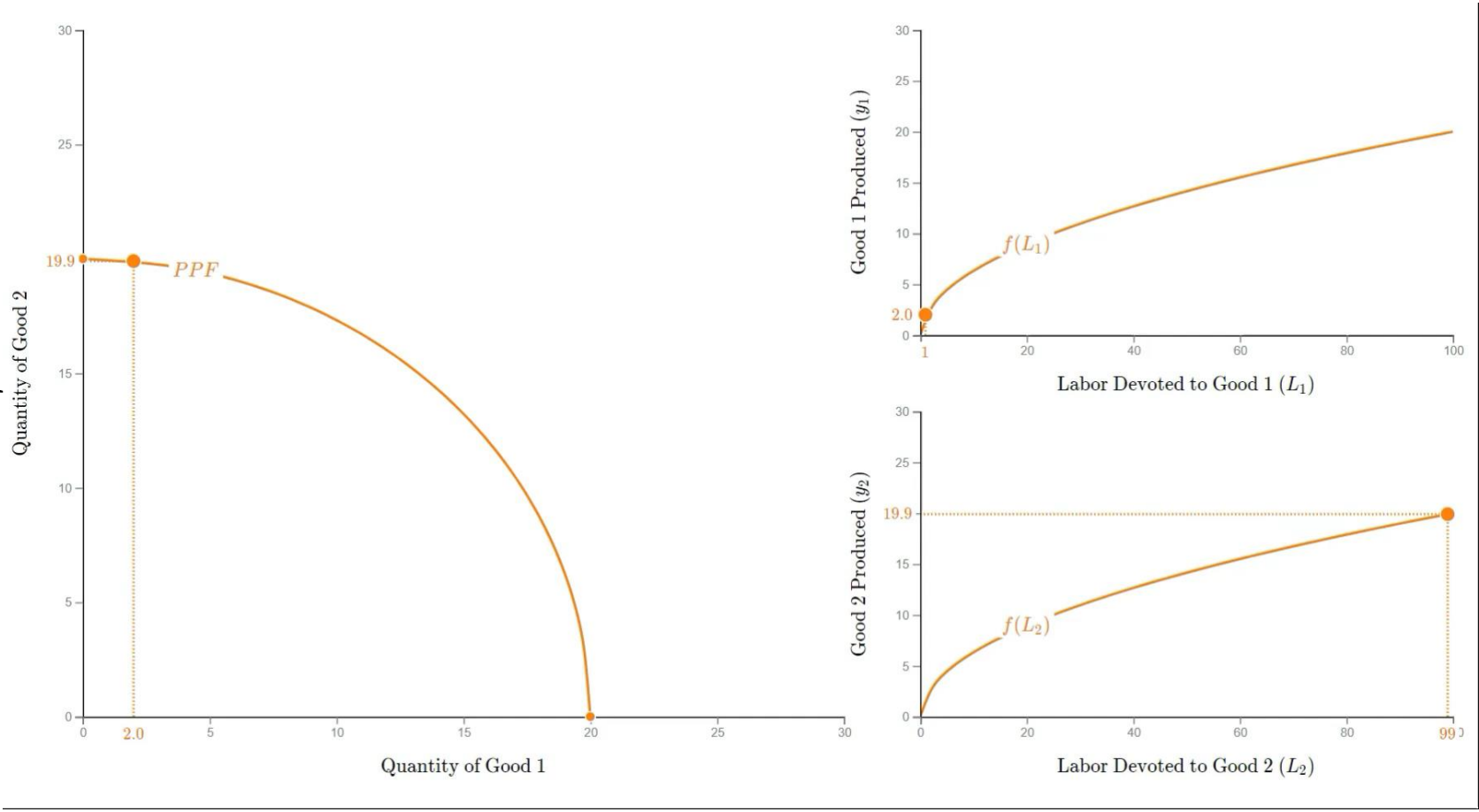
- Goods 1 and 2 can be produced by "linear technology" using labor
- 100 labor hours allocated to producing two goods
- How much of the two goods can be produced?
- **Production-possibilities frontier** shows tradeoff: How much 2 can we produce for any amount of 1?
- Constant slope of PPF is **marginal rate of transformation** (MRT)



https://www.econgraphs.org/graphs/micro/equilibrium/general_equilibrium/ppf_and_production_functions_linear

Nonlinear PPF and MRT

- Now think about diminishing returns to labor in production
- Social tradeoff between producing 1 and 2 is not linear
- **MRT = absolute slope of PPF** gets smaller as we produce more 2 and less 1



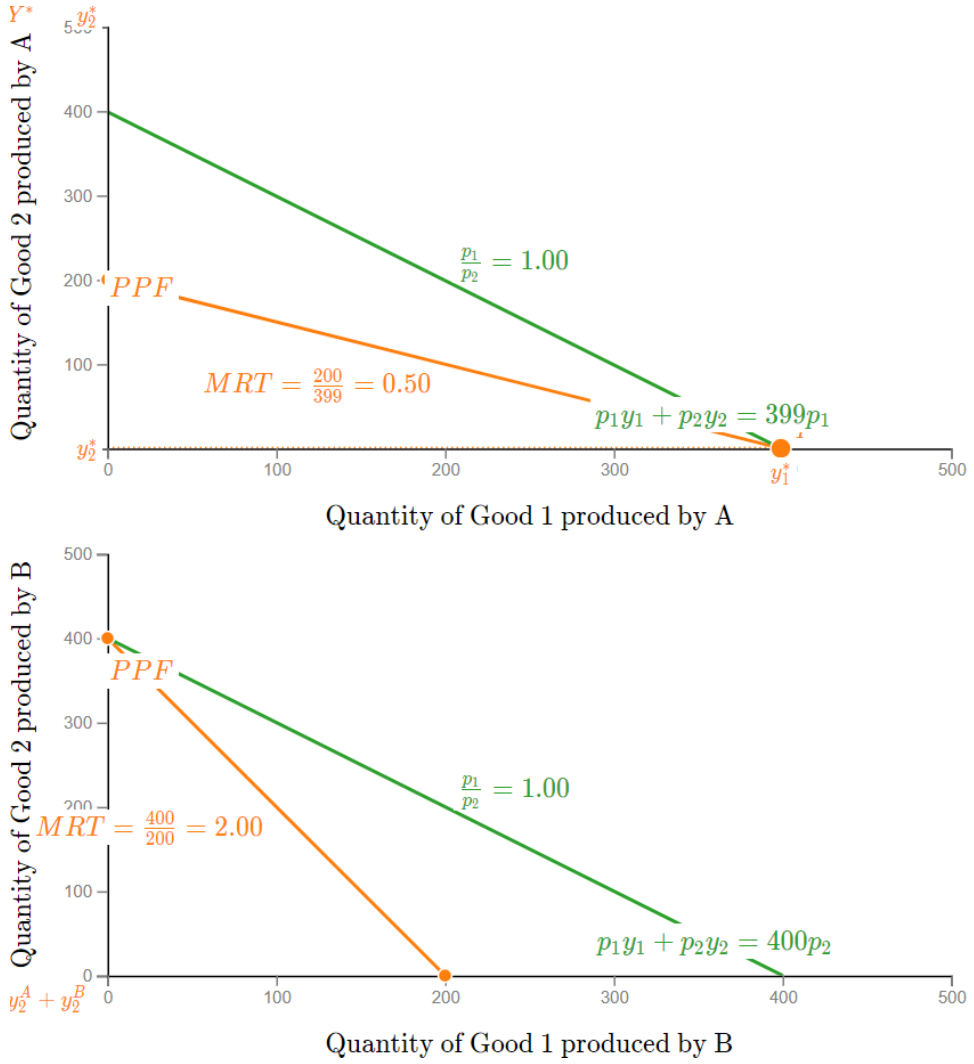
https://www.econgraphs.org/graphs/micro/equilibrium/general_equilibrium/ppf_and_production_functions_sqrt

Algebra of allocative efficiency

- Which point on production-possibilities frontier to choose?
- Tradeoff in producing: $MRT_{12} = MC_2/MC_1$
- **Allocative efficiency**: $MRT_{12} = MRS^i_{12}$ for every consumer i
- Competitive equilibrium:
  - Each consumer sets $MRS_{12} = P_2/P_1$
  - Each producer sets $P_2 = MC_2$ and $P_1 = MC_1$
  - So $MRT_{12} = MC_2/MC_1 = P_2/P_1$
  - $MRT_{12} = MRS^i_{12}$ and allocative efficiency is achieved
- Price system sends appropriate scarcity signals to producers and consumers
- This is why we have stressed $MC = P$ as efficiency condition

PPF and gains from international trade

- Production-possibilities frontier can also illustrate the social **gains from international trade**
- World price ratio will be between ratio in two countries
- Each country can move outside its PPF by trading and achieve higher consumption of two goods



https://www.econgraphs.org/graphs/micro/equilibrium/comparative_advantage/two_ppfs_and_supply_and_demand_linear

Bottom line on perfect competition

- We have argued that perfect competition is a rare, special case
  - Economy is never going to be perfectly competitive
- But perfect competition leads to **perfectly efficient outcomes**
- **Prices convey scarcity signals** that guide agents to optimal decisions
- BUT … we have neglected several market failures that can lead to inefficiency, even if all agents were price takers
  - **Externalities**: One agent's actions affect well-being of others
  - **Public goods**: Goods that cannot be sold and are consumed collectively
  - **Technological progress**: Motivation for research and development
  - **Inequality**: Competition won't assure that everyone is well-fed
- Next week we begin discussing all of these market failures

Review

- Perfect competition can lead to efficient resource allocation
  - Exchange efficiency
  - Input-use efficiency
  - Allocative efficiency
- We use the Edgeworth box and the production-possibilities frontier to demonstrate efficiency
- Efficiency and equality are separable questions, and competition doesn't guarantee equality

Daily diversion

A cleverly amusing (at least I think so!) set of definitions was published by Ambrose Bierce in 1911 as *The Devil's Dictionary*. Here's one that is timely around Election Day:

Incumbent, *n.*, A person of the liveliest interest to the outcumbents.

What comes next?

- The remaining four microeconomics classes are devoted to market failures: situations in which the price system does not lead to efficient resource allocation
- Monday's case study looks at the Grand Banks fishery off of eastern Canada as an example of an externality
- Problem Set #6 is due Wednesday