

Chapter 10

General Equilibrium and Welfare

Economic Welfare

- Last chapter outline how a competitive market maximizes social welfare, but there are many types of markets other than competitive
- The combination of all market outcomes defines social welfare for any given state of the world
- The study of the relative desirability of different states of the world (or allocation of resources) is known as **Welfare Economics**

Anti-Price Gouging Laws

- Background:

- After a disaster strikes, equilibrium prices tend to rise
- Many state governments enforce anti-price gouging laws to prevent this, but neighboring states might allow prices to adjust freely

- Questions:

- Does a binding price control that affects one state but not a neighbor cause shortages?
- How does it affect prices and quantities sold in the two states?
- Which consumers benefit from these laws?

General v. Partial Equilibrium

- **Partial Equilibrium Analysis:** examining changes in equilibrium conditions in one market in isolation
 - Assumes events in one market don't affect other markets
- **General Equilibrium Analysis:** the study of how equilibrium is determined simultaneously in ALL markets
 - In its purest form, this is impossible to measure
 - In reality, selecting a few closely related markets and looking at their equilibrium formation jointly is more feasible

Basic Tools for Analyzing Social Welfare: The Pareto Criteria

- The goal is to be able to rank one allocation of resources over another — without having to make interpersonal utility comparisons
- **Pareto improvement:** a reallocation of resources that makes at least one person better off without harming anyone else
- **Pareto Efficient:** an allocation of resources such that the ONLY way to make one person better off is to harm someone else

General Equilibrium Approach in a Simple Endowment Economy

- Suppose we have the simplest economy you can imagine:
 - 2 people (each maximizing their own utility)
 - 2 goods in fixed amounts
 - No production (Endowments: initial allocation of the goods between the two people)
- We are going to develop a system called an **Edgeworth Box** to analyze the situation and make conclusions about social welfare

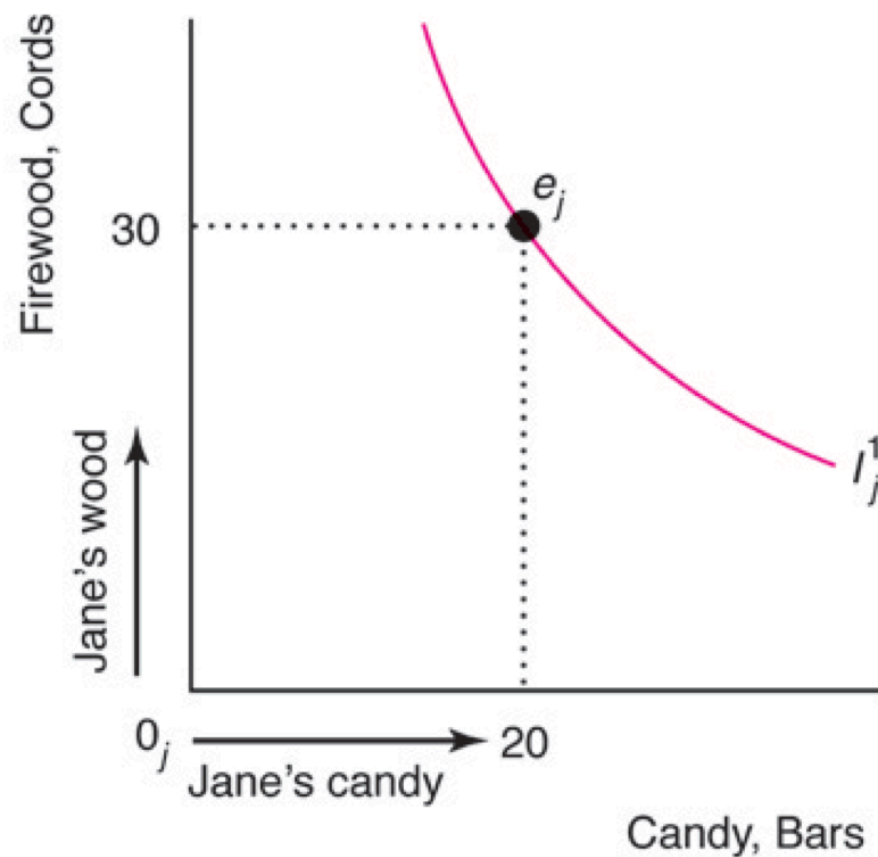
Trade Between Two People

- Consider two neighbors, Jane and Denise, who each have an initial endowment of firewood and candy
 - Jane: 30 cords of firewood and 20 candy bars
 - Denise: 20 cords of firewood and 60 candy bars
- These endowments can be shown graphically using indifference curves

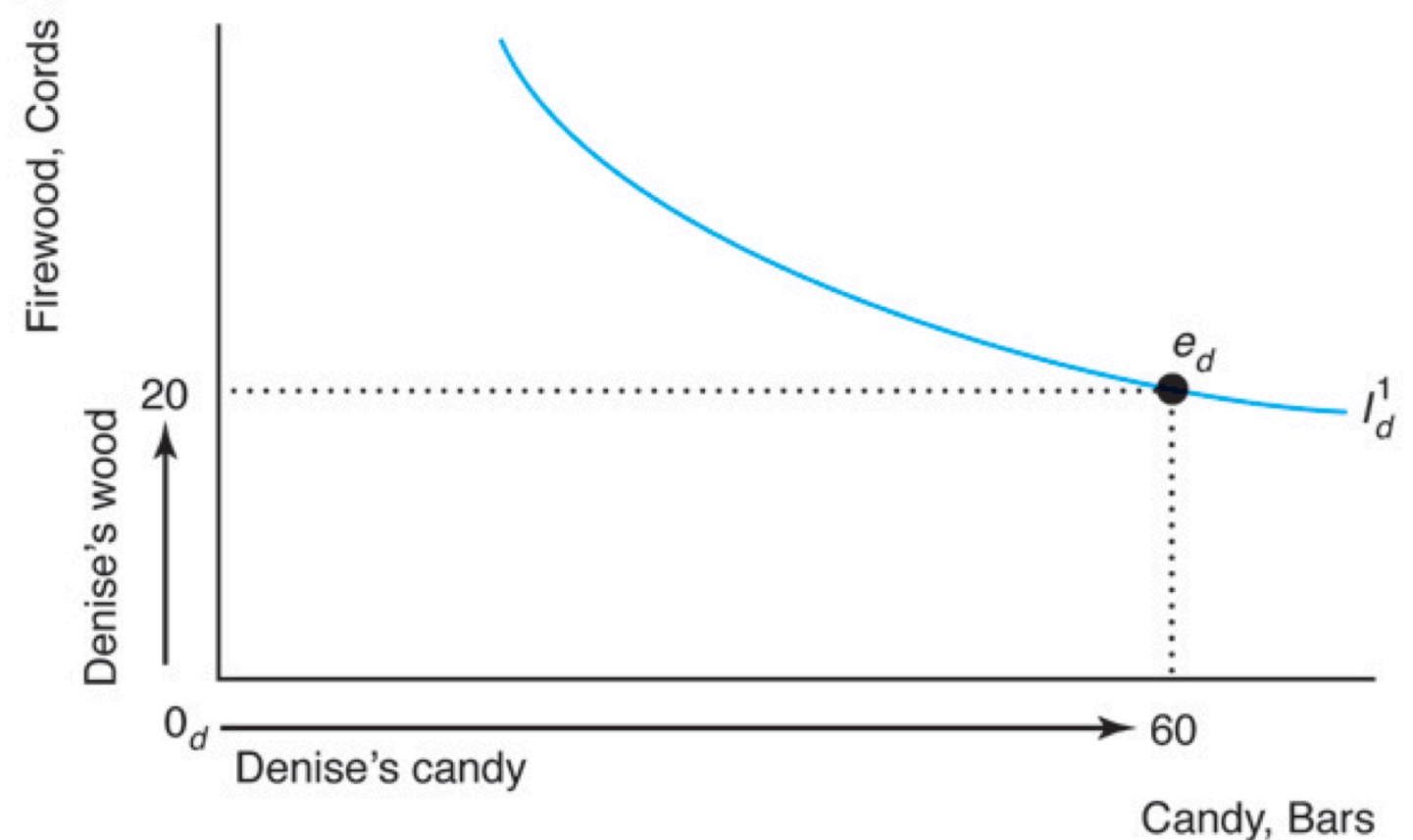
Trade Between Two People

- Jane and Denise before they engage in trade:

(a) Jane's Endowment



(b) Denise's Endowment

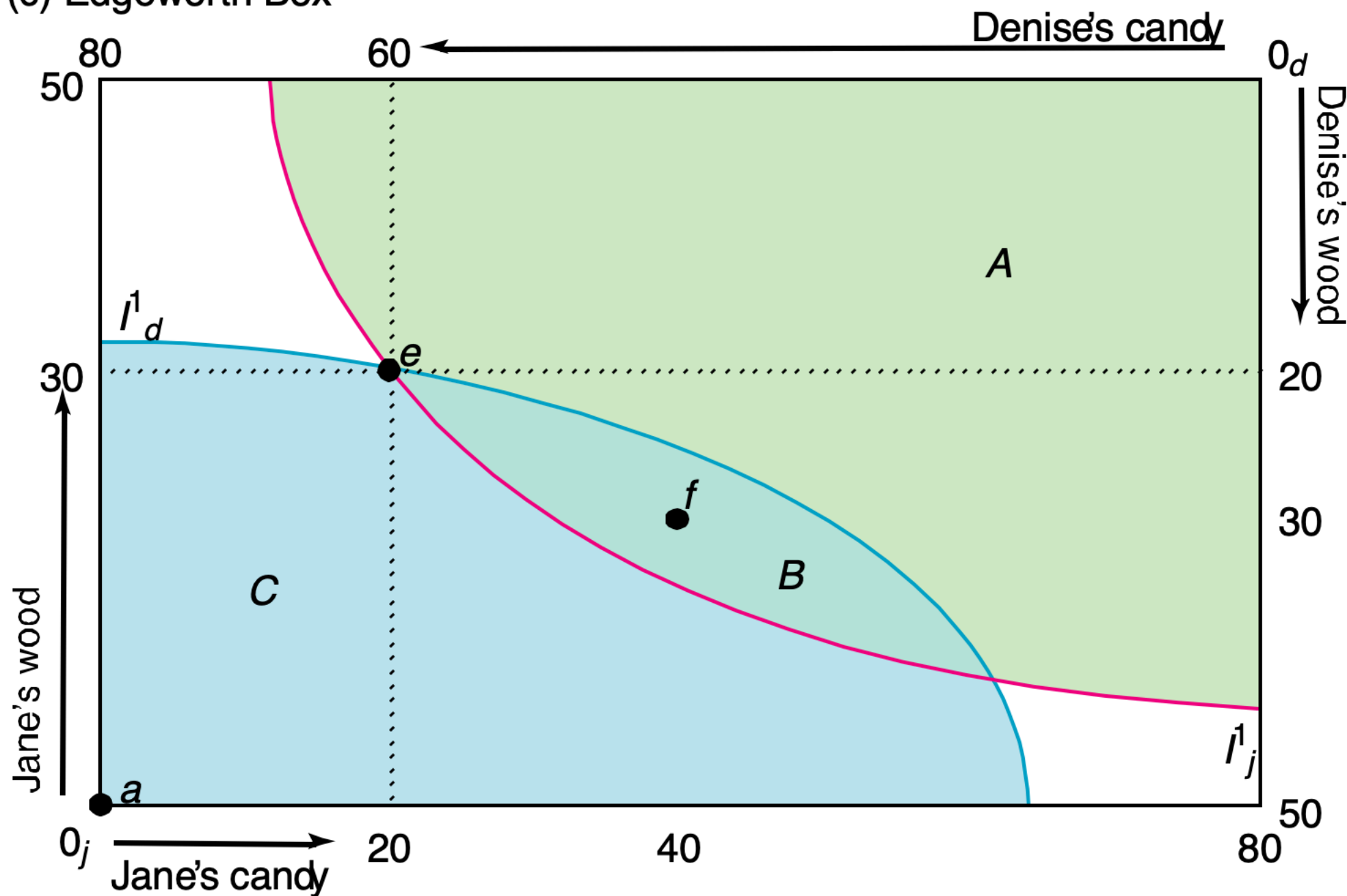


Trade Between Two People

- If Jane and Denise do not trade, they can each only consume their initial endowments
- In order to see whether Jane and Denise would benefit from trading firewood and candy bars, we use an Edgeworth Box
- **Edgeworth Box:** illustrates trade between two people with fixed endowments of two goods
 - Edgeworth boxes are useful in general equilibrium models because both the firewood and candy bar markets are being affected simultaneously

Endowments in an Edgeworth Box

(c) Edgeworth Box



Trade Between Two People

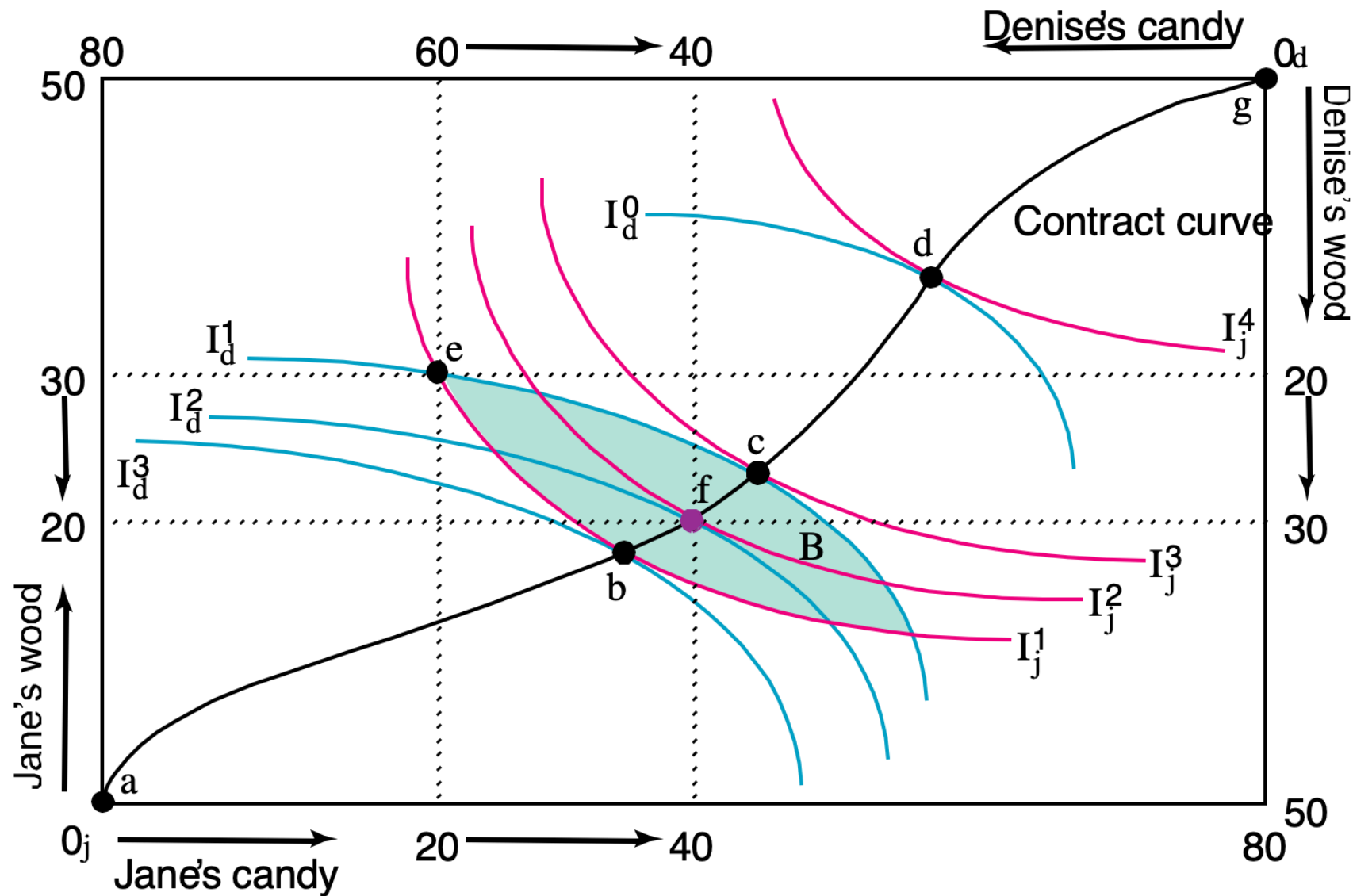
- Should Jane and Denise trade? Yes
- We make four assumptions about their tastes and behavior to answer this question:
 1. **Utility maximization**: each person maximizes their utility
 2. **Usual-shaped indifference curves**: each person's indifference curves have the usual convex shape
 3. **Nonsatiation**: each person has a strictly positive marginal utility for each good — wants as much as possible
 4. **No interdependence**: neither person's utility depends on the other's consumption and neither person's consumption harms the other

Trade Between Two People

- The **contract curve** is the set of all Pareto-efficient bundles
 - Name refers to the fact that Jane and Denise are unwilling to engage in further trades, or contracts, outside the contract curve
 - These allocations are the final contracts
- The contract curve is derived by maximizing Jane's utility subject to leaving Denise's utility unchanged (or vice versa)
 - Calculus can be used to show that this maximization problem comes down to the point where their indifference curves have the same slopes:

$$MRS_J = MRS_D$$

Contract Curve



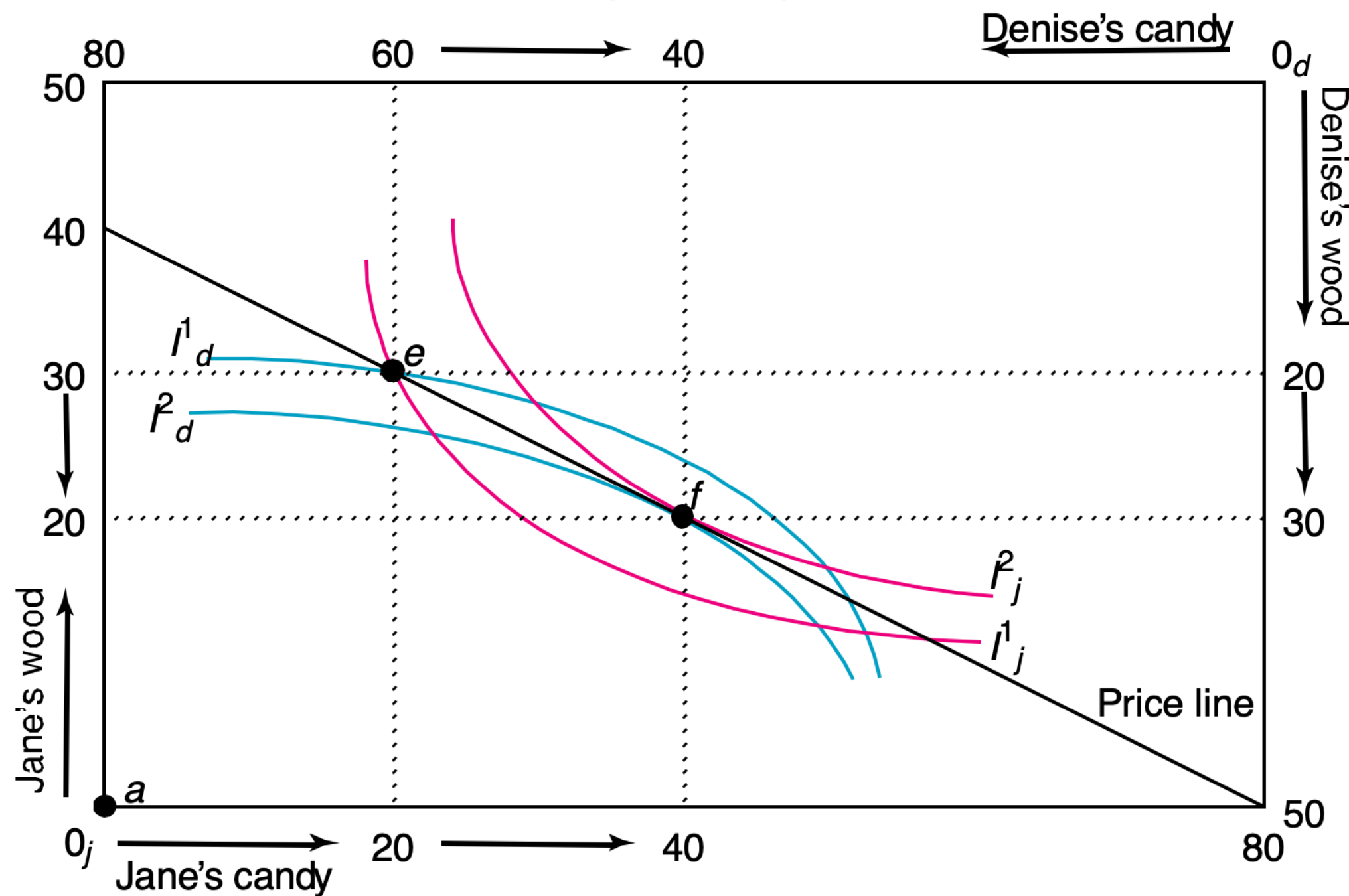
| | <u>Endowment, e</u> | | <u>Trade</u> | | <u>New Allocation, f</u> | |
|--------|----------------------------------|-------|--------------|-------|---------------------------------------|-------|
| | Wood | Candy | Wood | Candy | Wood | Candy |
| Jane | 30 | 20 | -10 | +20 | 20 | 40 |
| Denise | 20 | 60 | +10 | -20 | 30 | 40 |

Competitive Exchange

- Given the prices of two goods, a price line can be added to the Edgeworth Box
 - The price line is all the combinations of goods that Jane could get by trading, given her endowment
- If the price of firewood is \$2 and the price of a candy bar is \$1, then the price line indicates that Jane would choose to trade wood for candy and move from point *e* to point *f*
- Would Denise also want to trade at those prices?

Competitive Equilibrium

(a) Price Line That Leads to a Competitive Equilibrium



Using Calculus to Define the Contract Curve

- We can use a simple procedure for constrained optimization problems called the Lagrangian method to establish the conditions that must hold if we are at a point of Pareto Efficiency
- We are maximizing Jane's utility, subject to the constraint that Denise must stay on her original indifference curve

$$MRS_{Jane} = \frac{\delta U_{Jane} / q_{J1}}{\delta U_{Jane} / q_{J2}} = \frac{\delta U_{Denise} / q_{D1}}{\delta U_{Denise} / q_{D2}} = MRS_{Denise}$$

Competitive Exchange and Pareto Efficiency

- Competitive markets have 2 desirable properties relating to the Pareto Criteria
 - **1st and 2nd Theorems of Welfare Economics**
 - Gains from trade can only occur when society is currently at an allocation of resources where the MRS values vary across consumers

1st Theorem of Welfare Economics

- A competitive equilibrium must result in a Pareto efficient allocation
 - If additional Pareto improvements were possible, competitive markets would take advantage of them
- This theorem speaks to the **efficiency** aspect of competitive markets

2nd Theorem of Welfare Economics

- Any efficient allocation can be achieved by competition, given an appropriate allocation of goods (or income) and the currently prevailing price ratio
 - Society can get to any point on the Contract Curve it desires
- This speaks to the idea that **equity** concerns can still be addressed through income redistribution, combined with the competitive market processes

Trade Follows the Price Line Back to the Contract Curve

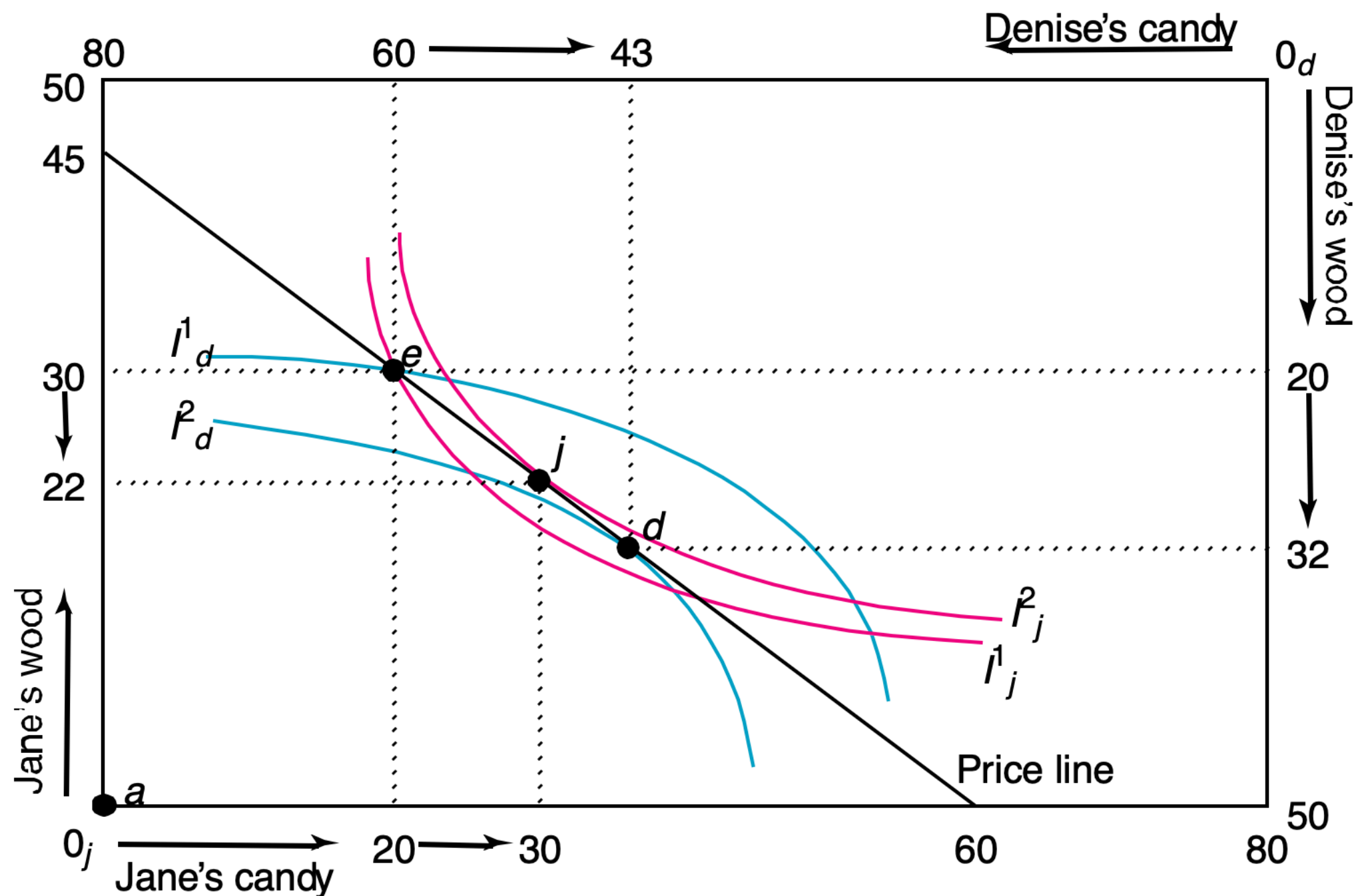
- At allocation e , the two individuals do not have the same MRS between the two goods
- The price line allowed them to trade until they reached a point where they both had the same MRS and it was equal to the (negative) ratio of prices between the goods

$$MRS_{Jane} = MRS_{Denise} = \frac{P_{candy}}{P_{wood}}$$

- Question: what if the initial allocation and current set of prices do not lead back to a point on the contract curve?

Competitive Equilibrium

(b) Prices That Do Not Lead to a Competitive Equilibrium



What Went Wrong?

- The problem was that, given current prices, Jane wanted to sell too little wood and Denise wanted to sell too many candy bars
- Prices would adjust so that the price of wood went **up** and the price of candy went **down**
 - This would continue until the amount of wood Jane wanted to sell was equal to what Denise wanted to buy and the amount of candy Denise wanted to sell was equal to what Jane wanted to buy
 - This is the power of the market — prices can fluctuate to bring about Pareto efficiency

Competitive Efficiency with Production

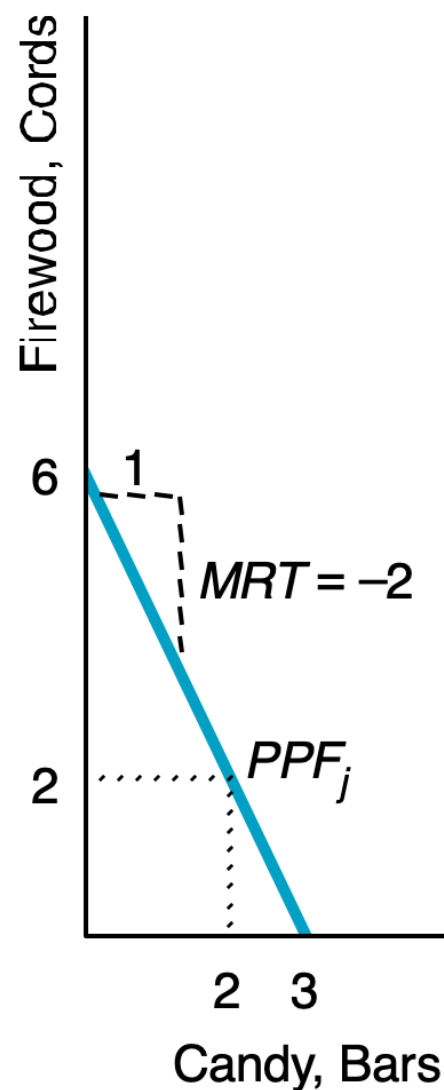
- **Absolute advantage:** being able to produce **more** than another person/firm/country of a good
- **Comparative advantage:** being able to produce a good at a **lower opportunity cost** than another person/firm/country
- Note that in these types of problems, the opportunity cost of production is framed as the foregone production of a different good

Comparative Advantage and Production

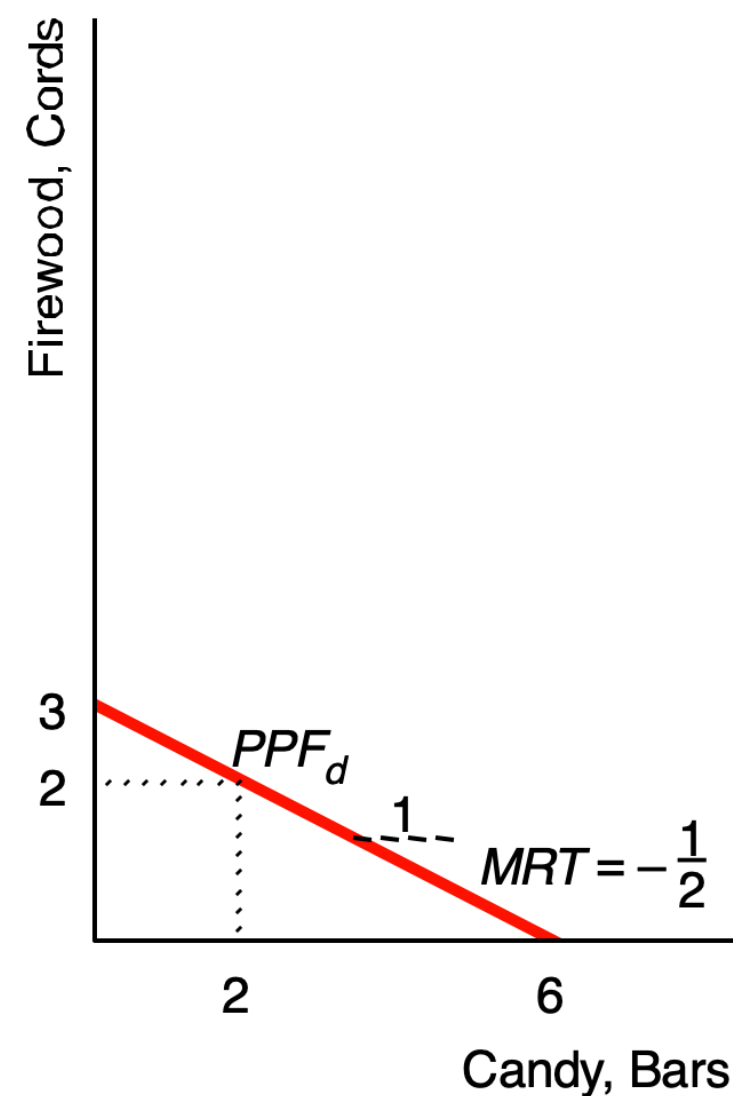
- Each person (or firm or country) will have their own individual MRT between the two goods
- As long as they differ —one person **must** have the comparative advantage for one (and only one) of the goods

Comparative Advantage and the Production Possibility Frontiers

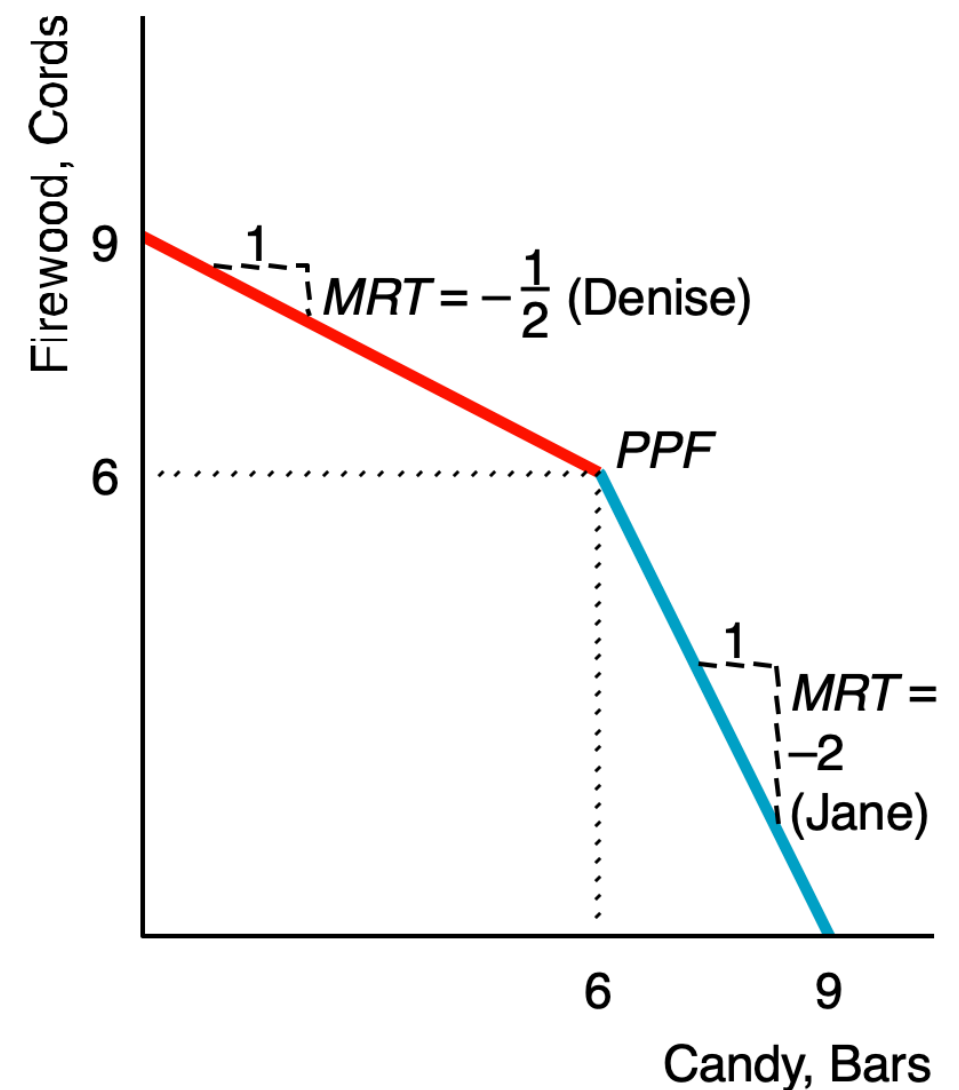
(a) Jane



(b) Denise



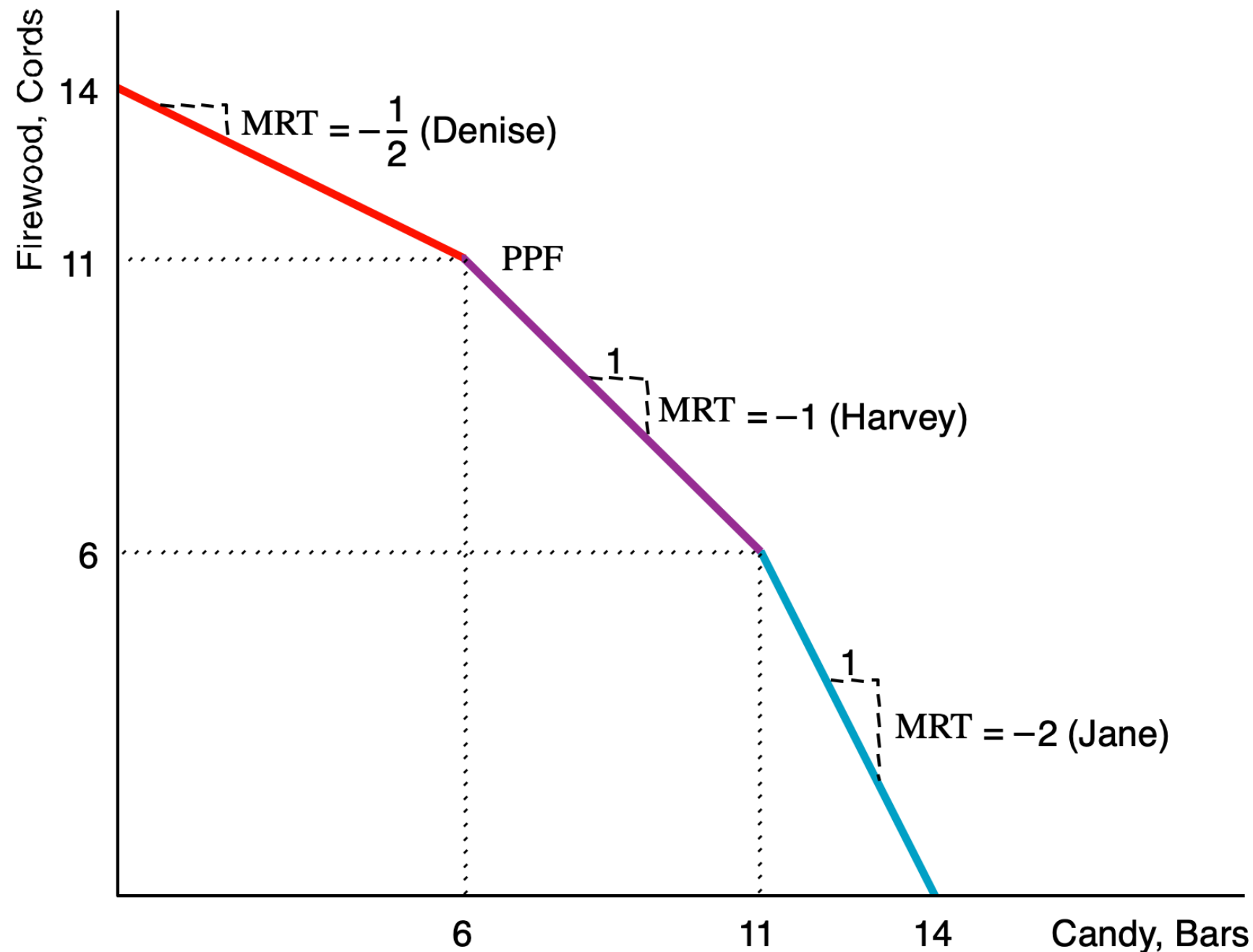
(c) Joint Production



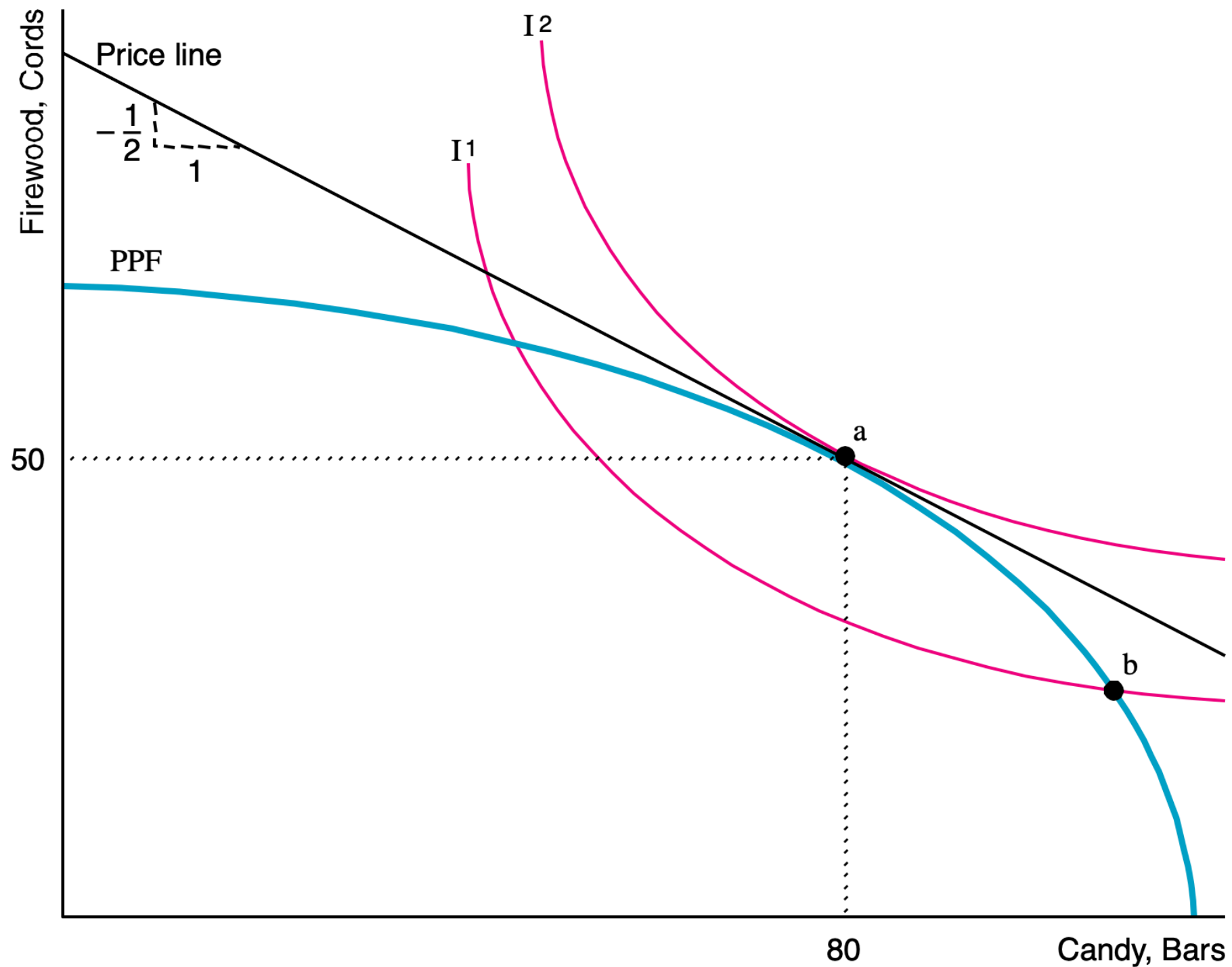
Practice Problem

- Suppose that workers in Soonertown can each produce 24 units of cloth or 6 units of food each day, and workers in Longhornsville can produce 15 units of cloth or 3 units of food each day
 - Soonertown has 50 workers and Longhornsville has 100. Draw the production possibilities curve for each city separately. Be sure to place clothing production on the horizontal axis and food on the vertical
 - Calculate Longhornsville's opportunity cost of producing one unit of clothing
 - Calculate Soonertown's opportunity cost of producing one unit of clothing
 - What are Longhornsville and Soonertown's respective opportunity costs of producing one unit of food?
 - Which city has the comparative advantage for food? For cloth?

Generalizing to More People Involved in Trade



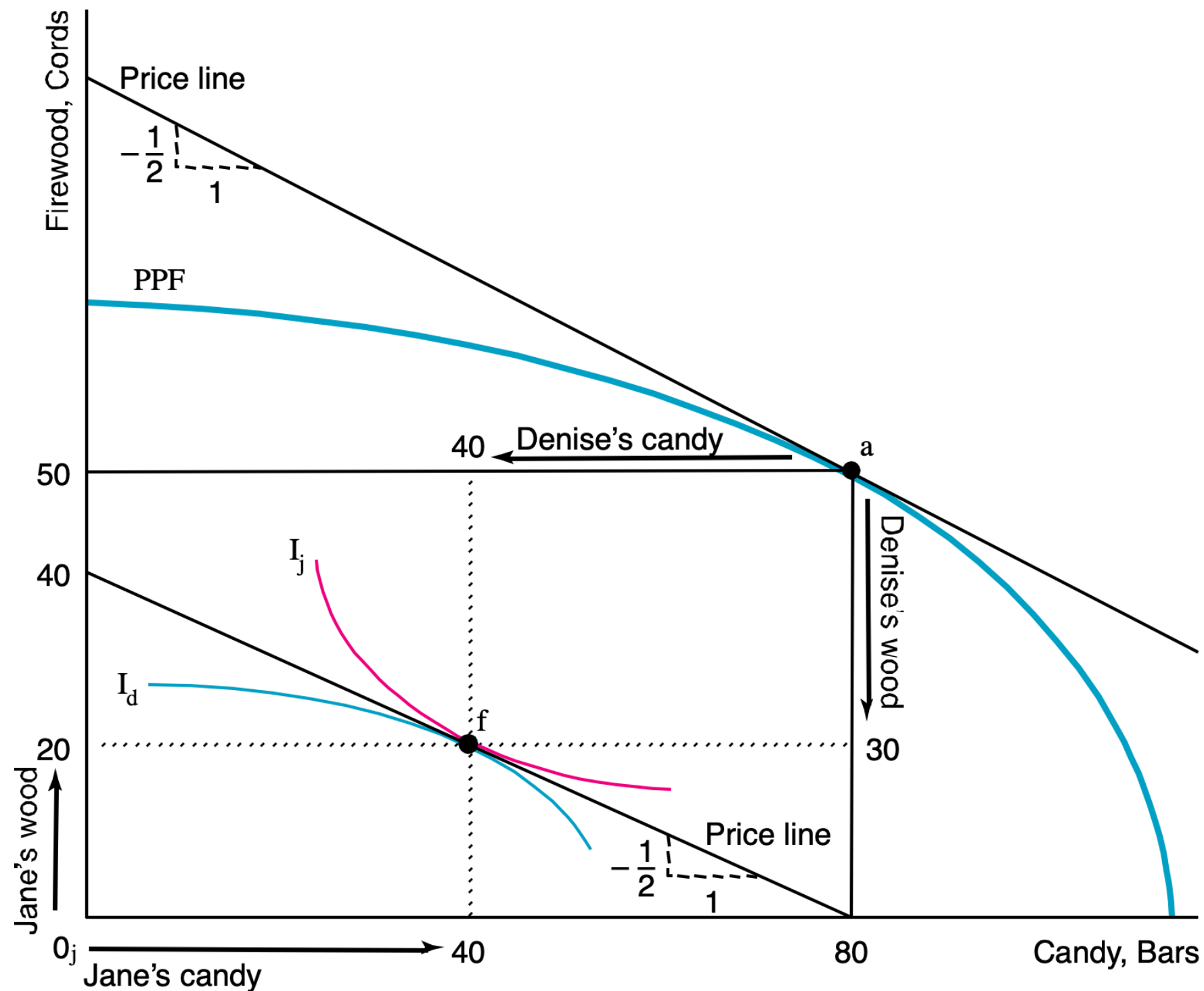
Optimal Product Mix



Optimal Production Combined with Optimal Allocation

- From optimal allocation we had that the MRS for all consumers had to be the same
 - Now we can add that the MRT must also equal the same consistent MRS if we have efficiency in allocation (MRS for all consumers equal) and production (MRT for all equal)
- The slope of the Production Possibilities Frontier (MRT) also determines the **price ratio** between the two goods

Competitive Equilibrium

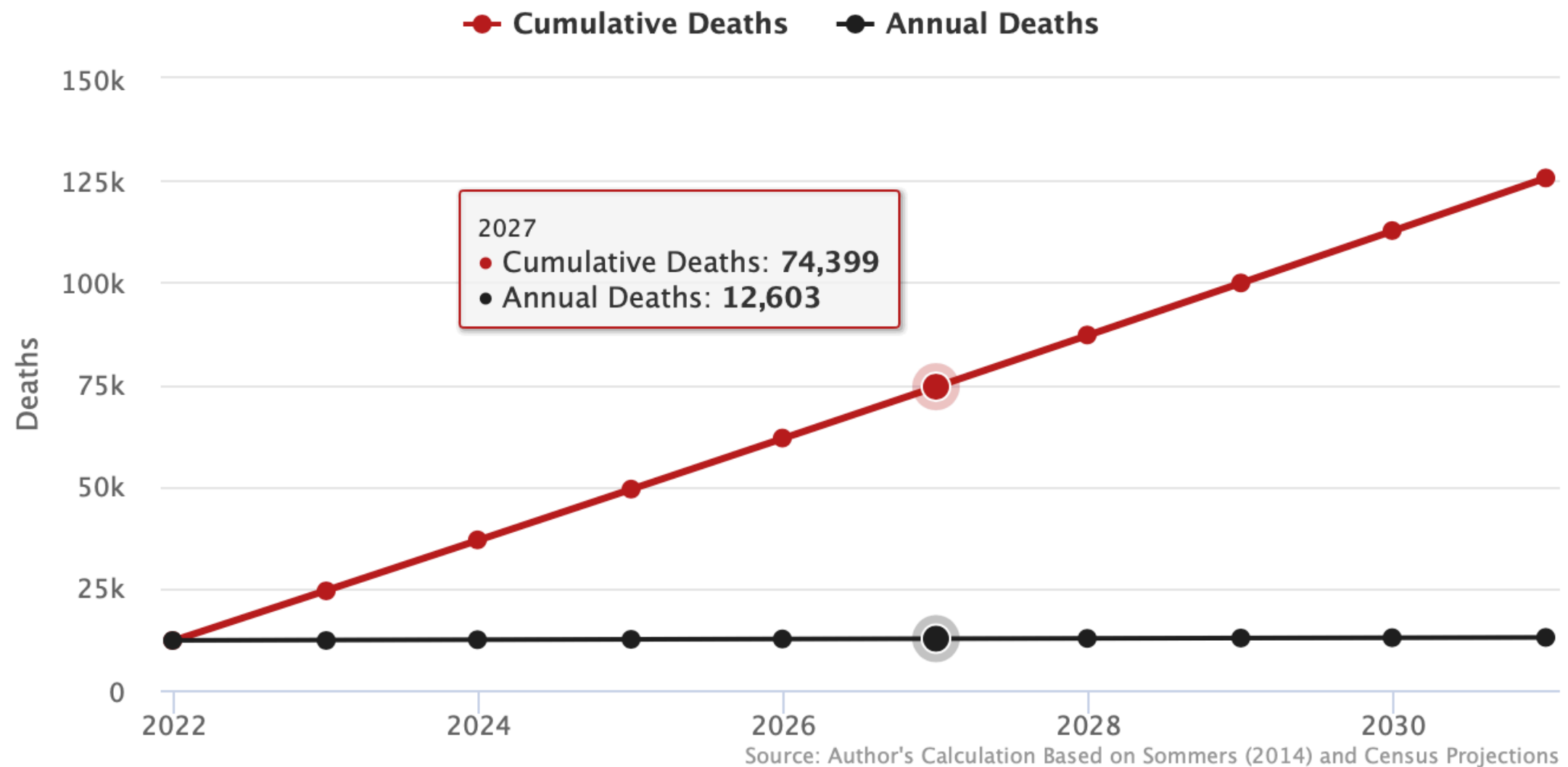


Efficiency and Equity

- How well-off people in society are depends on efficiency (how big the pie is) and equity (how the pie gets cut)
 - Most Econ classes deal almost entirely with concepts related to the first of these concerns
 - The second is still very important because it influences how society organizes itself

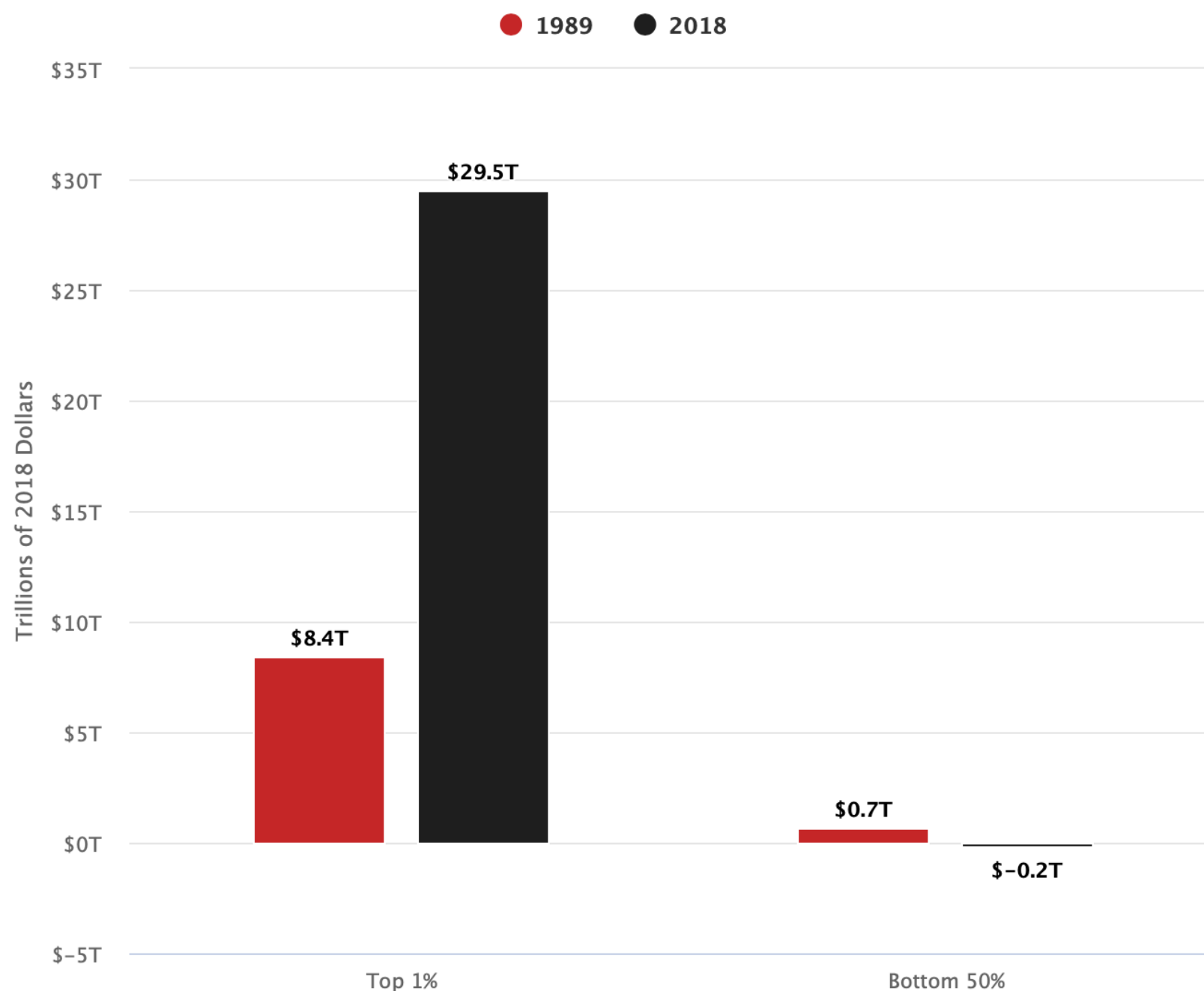
Health Insurance

Number of People Who Will Die from Uninsurance Under Biden's Health Plan (2022–2031)



U.S. Wealth Distribution

Total Wealth of Top 1% and Bottom 50% (1989–2018)



Source: Author's Calculations of Distributive Financial Accounts

Income Inequality

| | Ratio of the Share of Income of | |
|--------------------|---------------------------------|-------------------------------|
| | Richest 10% to Poorest 10% | Richest 20% to Poorest 20% |
| Lesotho | 105.0 | 44.2 |
| South Africa | 65.1 | 33.6 |
| Mexico | 45.0 | 19.3 |
| China | 18.4 | 10.7 |
| Russian Federation | 20.3 | 10.5 |
| United States | 15.9 | 8.4 |
| United Kingdom | 13.8 | 7.2 |
| Australia | 12.5 | 7.0 |
| Canada | 10.1 | 5.8 |
| Pakistan | 7.6 | 4.8 |
| Germany | 6.9 | 4.3 |
| Sweden | 6.2 | 4.0 |
| Japan | 4.5 | 3.4 |

Source: Human Development Report 2004, hdr.undp.org/reports/global/2004.