Microeconomic Theory Review

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Evaluate the Earned Income Tax Credit (EITC)

- For 2025, the NY EITC will rise from 30% to 45% of the federal EITC
- Gov. Hochul asks how this will affect hours worked and labor force participation
- What can you say with near certainty?
- What are you less certain about?
- Depends on (1) the shape of the EITC and (2) your model of behavior

Depends on modeling assumptions

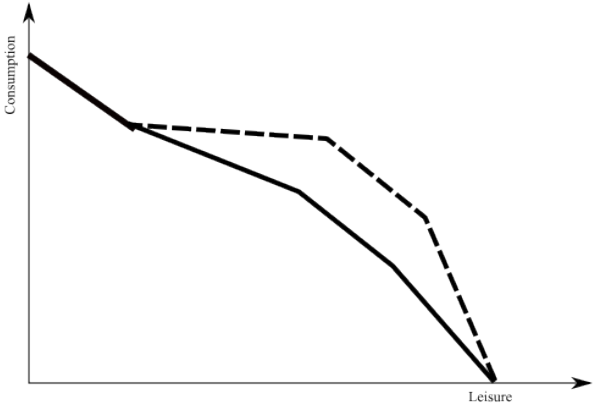


Figure 1: The EITC budget constraint where “leisure” is time not spent working. As “leisure” rises, labor supply falls.

Depends on modeling assumptions

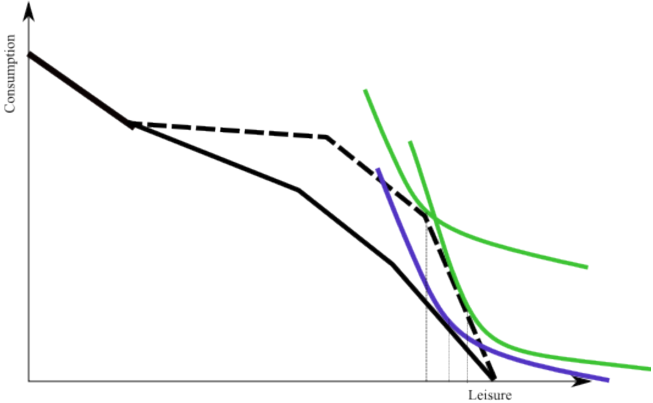


Figure 2: On the "phase-in," substitution reduces leisure, but income effect positive.

Depends on modeling assumptions

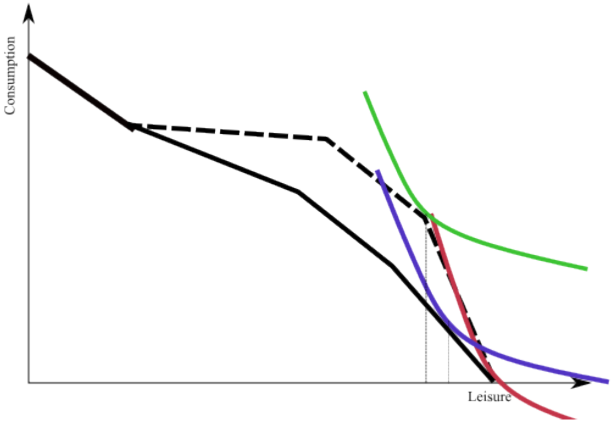


Figure 3: But no one stops working who is working.

Depends on modeling assumptions

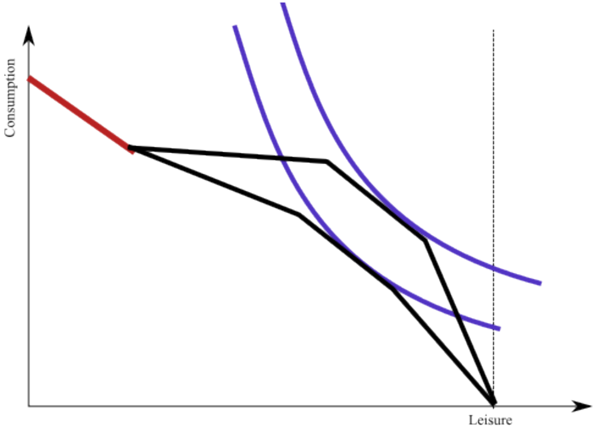


Figure 4: Someone on the “flat” of the EITC just receives an income effect. If we assume leisure is a “normal” good, then that means more leisure, less working.

Depends on modeling assumptions

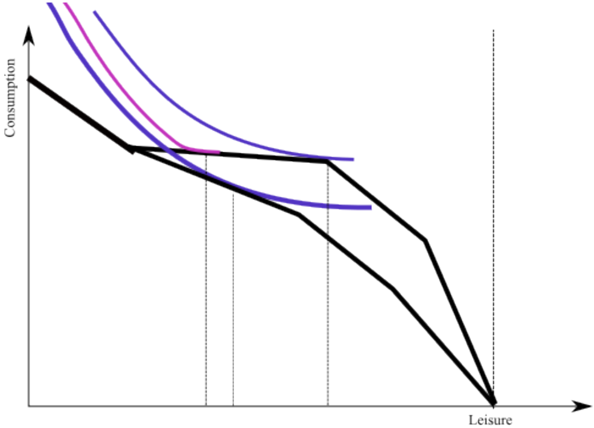


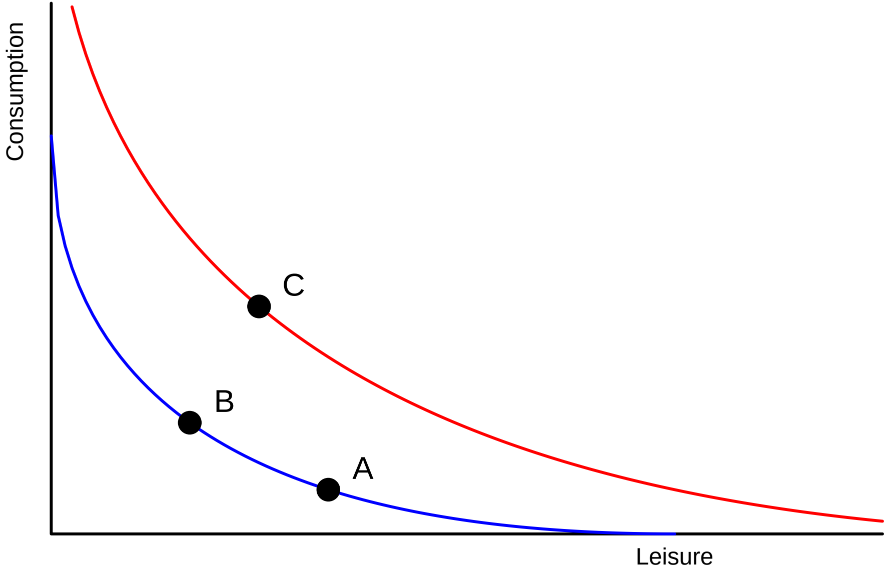
Figure 5: Someone on the "phase-out" of the EITC gets an income and substitution effect towards more leisure. If leisure is a normal good, the purple line is impossible.

Types of tools

- **Economic theory**
  - Intentionally simplified models to understand behavior
  - Simplifications can be unrealistic but help us understand what variables are most critical to know
  - Can be **normative** and **positive**
- **Empirical analysis**
  - Use data to estimate relationships between variables
  - Can be used to test theories
  - Often all about causal inference

Economic Theory Tools

- Utility function: a mathematical representation of preferences
- Assumption: individuals have well-defined “rational” preferences and attempt to achieve the highest level of well-being
- Indifference curves


Consumption
C
B
A
Leisure

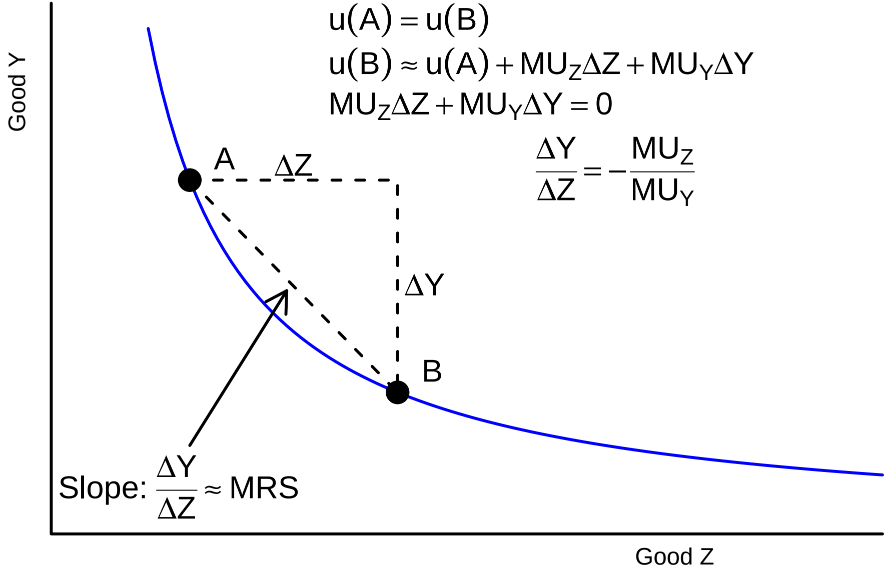
Utility

- Marginal utility

$$\begin{aligned} U(Z,Y) &= 20\ln(Y) + 10\ln(Z) \\ \frac{\partial}{\partial x}(\ln(X)) &= \frac{1}{X} \\ MU_Z(Z,Y) &= 0 + 10\cdot\frac{1}{Z} = \frac{10}{Z} \\ MU_Y(Z,Y) &= 20\cdot\frac{1}{Y} + 0 = \frac{20}{Y} \end{aligned}$$

  If consuming $(Z, Y) = (2, 2)$, the marginal utilities are:
  - $MU_Z(2,2) = \frac{10}{2} = 5$
  - $MU_Y(2,2) = \frac{20}{2} = 10$
- The marginal rate of substitution (MRS) — the slope of the indifference curve. MRS of good Z to good Y:

$$MRS = -\frac{MU_Z}{MU_Y} = -\frac{10/Z}{20/Y} = -\frac{1}{2}\frac{Y}{Z}$$



$u(A) = u(B)$
$u(B) \approx u(A) + MU_Z \Delta Z + MU_Y \Delta Y$
$MU_Z \Delta Z + MU_Y \Delta Y = 0$
$\frac{\Delta Y}{\Delta Z} = -\frac{MU_Z}{MU_Y}$
A
ΔZ
ΔY
B
Slope: $\frac{\Delta Y}{\Delta Z} \approx MRS$
Good Y
Good Z

Budget constraint

- Optimization is subject to (budget) constraints
  Price of apples (A) is p_A. Price of bananas (B) is p_B. Income is Y.
  The budget constraint (BC) is:

$$p_A A + p_B B = Y$$

  If price of apples was 5, price of bananas was 7 and income was 35, the budget constraint would be

$$5A + 7B = 35$$

- Equivalently:

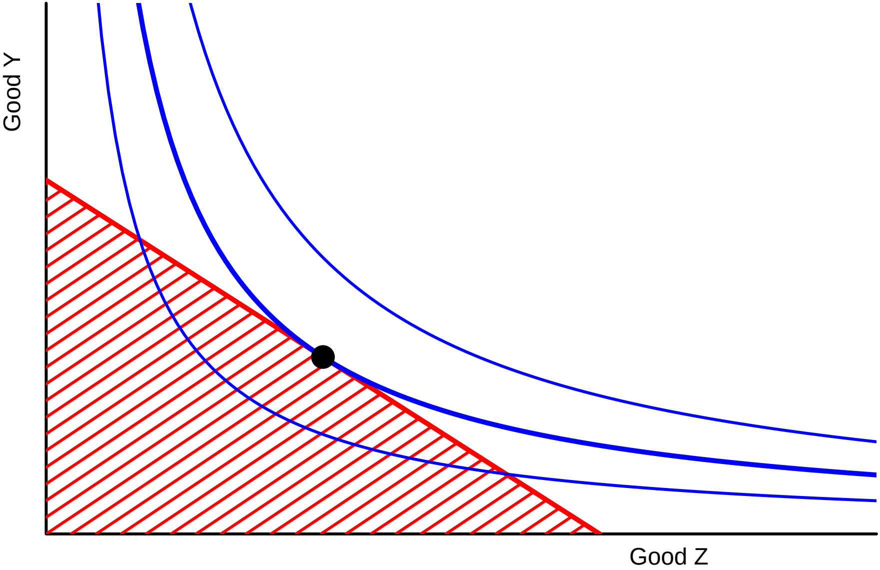
$$p_B B = Y - p_A A \qquad \Rightarrow \qquad B = \frac{Y}{p_B} - \frac{p_A}{p_B} A$$

- The slope of the budget constraint is $-\frac{p_A}{p_B}$.

Characterization of the optimum

The BC is (often) “tangent” to the indifference curve at the optimum.
Two conditions:

1. The slopes of the budget constraint and the indifference curve need to be the same:
$$-\frac{MU_A}{MU_B} = MRS = -\frac{p_A}{p_B}$$
2. The optimum is on the budget constraint
$$p_A A + p_B B = Y$$


Good Y
Good Z

Example

$$U(Y,Z) = \frac{1}{3}\ln(Y) + \frac{2}{3}\ln(Z)$$
$$P_Y = 10,\ P_Z = 20,\ Y = 120$$

Submit an answer

Method 1: $MRS = -\frac{\frac{1}{3}\frac{1}{Y}}{\frac{2}{3}\frac{1}{Z}} = -\frac{1}{2}\frac{Z}{Y}$.

The slope of the budget line is $-\frac{10}{20} = -\frac{1}{2}$. We need to solve:

$$\begin{aligned} -\frac{1}{2}\frac{Z}{Y} &= -\frac{1}{2} \\ 10Y + 20Z &= 120 \end{aligned}$$

Solution: $Z = Y = 4$.

Method 2:

The budget constraint is $10Y + 20Z = 120$ hence $Y = 12 - 2Z$. We want to pick the point with the highest utility on the budget constraint, hence we want to maximize

$$\frac{1}{3}\ln(12-2Z) + \frac{2}{3}\ln(Z)$$

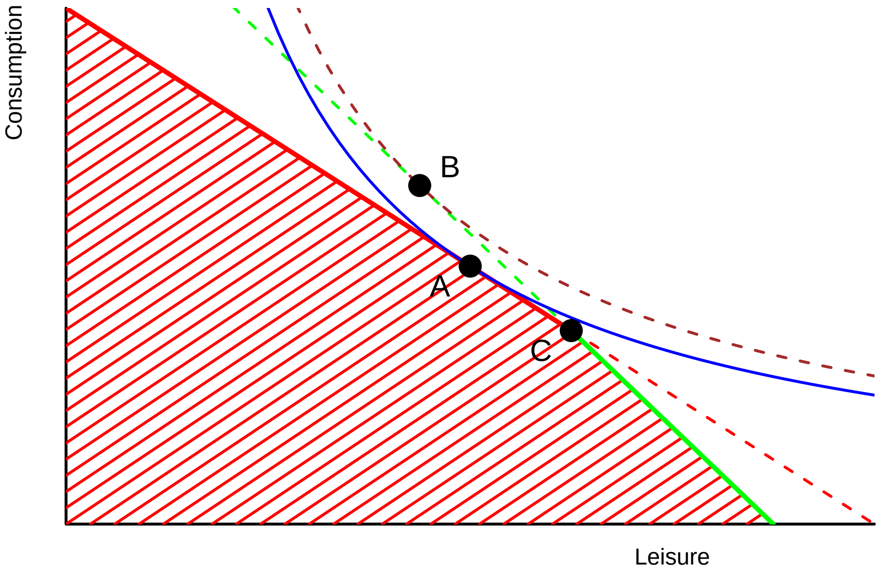
That requires $-\frac{2}{3}\frac{1}{12-2Z} + \frac{2}{3}\frac{1}{Z} = 0 \quad \Rightarrow \quad 12 - 2Z = Z$

$\Rightarrow$ hence $Z = 4$ and $Y = 12 - 2Z = 4$.

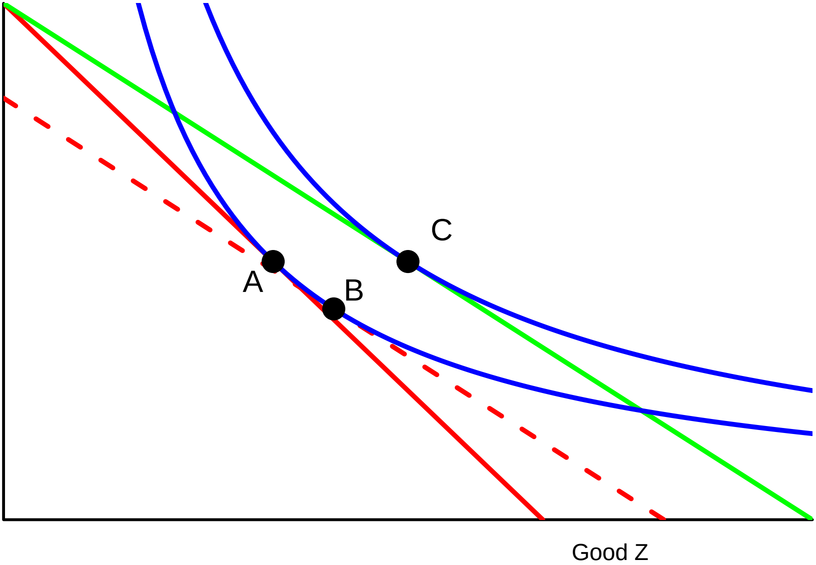
Nonlinear budget constraints

- Sometimes prices change after you consume a certain amount of a good
- What happens to the budget constraint then?
- Why care? Because they are pervasive in the tax/welfare context.
- Examples:
  - Earned Income Tax Credit (we'll talk more about it) provides a marginal subsidy if earnings are not too large and then slowly takes it away. Many related provisions in welfare programs.
  - Tax exemptions — no tax (labor valuable, leisure costly) up to certain income level, tax afterwards.
  - Progressive taxation — price of labor depends on your income.
  - Health insurance subsidies — the amount depends on the level of income.

Tax exemption over C: Why is budget constraint steeper?



Income and substitution effects



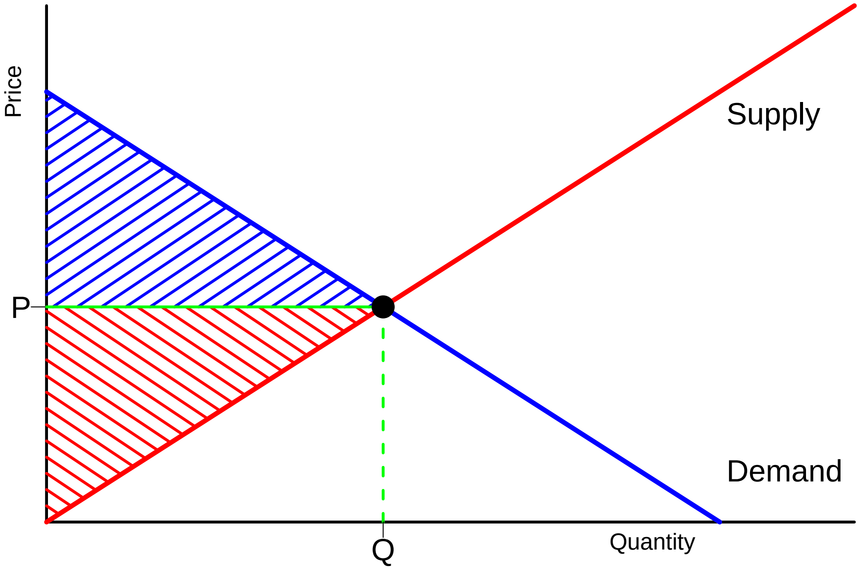
Elasticity (of demand)

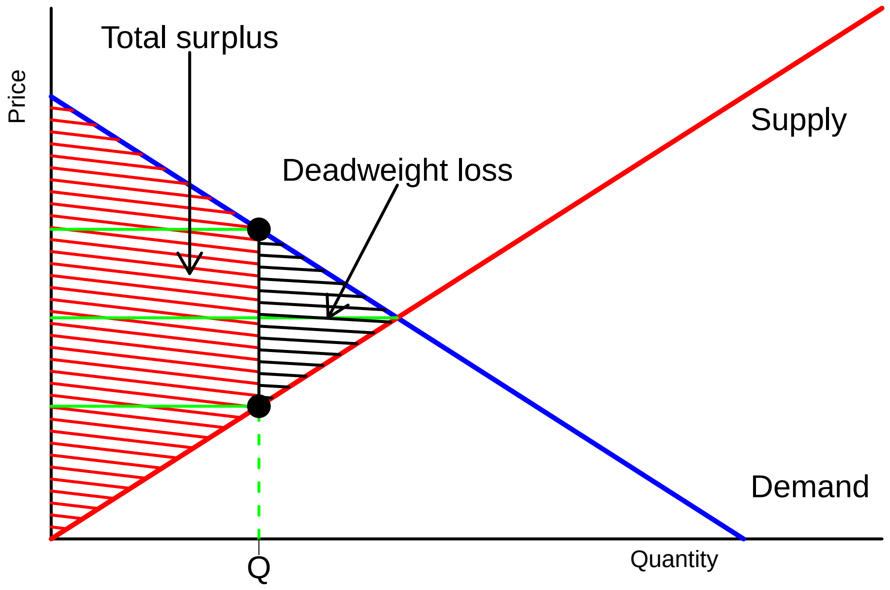
- Demand at given price p is $D(p)$
- It could be individual demand or aggregate demand, we can derive it based on utility maximization or based on observation or assume
- Slope: $D'(p)$ — how much demand changes with a dollar change in price
- A common way is to instead measure the slope by the *elasticity*: the percentage change in the demand in response to a 1% change in price
- $$\varepsilon = \frac{\%\text{ change in demand}}{\%\text{ change in price}} = \frac{\Delta D(p)/D(p)}{\Delta p/p} = \frac{p}{D(p)} D'(p)$$
- Another (equivalent) definition noting $\Delta \ln(x) \approx \%\Delta x$:

$$\varepsilon = \frac{\Delta \ln(D(p))}{\Delta \ln(p)}$$

- You can see it by substituting $x = \ln(p)$ so that $\frac{d\ln(D(p))}{d\ln(p)} = \frac{d\ln(D(e^{\ln(x)}))}{dx}$ and work through the derivative with respect to x.

Equilibrium and efficiency




Total surplus
Price
Supply
Deadweight loss
Demand
Q
Quantity

Pareto efficiency

- An allocation at which the only way to make one person better off is to make another person worse off is called *Pareto efficient*
- If an allocation is not Pareto efficient, there must exist a *Pareto improvement*.
- At an (interior) Pareto efficient allocation MRSs for all individuals are the same.

The First Theorem of Welfare Economics

- Assume (1) perfect competition; (2) existence of markets for all commodities; (3) utility increases in consumption of all goods
- Then:

  If a competitive equilibrium exists, it is a Pareto optimum
- This is the "invisible hand" theorem
- "proof:" in an equilibrium, MRSs (and MRTs if we don't ignore production) are equal to the ratio of prices and therefore are the same
- All gains from trade are exploited
- No need for the government?

Social welfare

- Pareto efficiency does not imply fairness
- The utility possibility frontier – anything from fully egalitarian to only one person getting utility can be possible and Pareto efficient
- The social welfare function
  - utilitarian: $U_1 + \cdots + U_N$
  - Rawlsian: $\min\{U_1, \cdots, U_N\}$

The Second Welfare Theorem

- Theorem (technical assumptions):
  Every Pareto efficient allocation can be reached by:
  1. Suitable redistribution of initial endowments [individualized **lump-sum** taxes based on individual characteristics *not* behavior]
  2. Then letting markets work freely
- $\Rightarrow$ No more conflict between efficiency and equity
- Anyone have guesses at a potential problem?

Edgeworth Box Contract curve: All Pareto efficient allocations Lump sum tax Marginal tax on good X

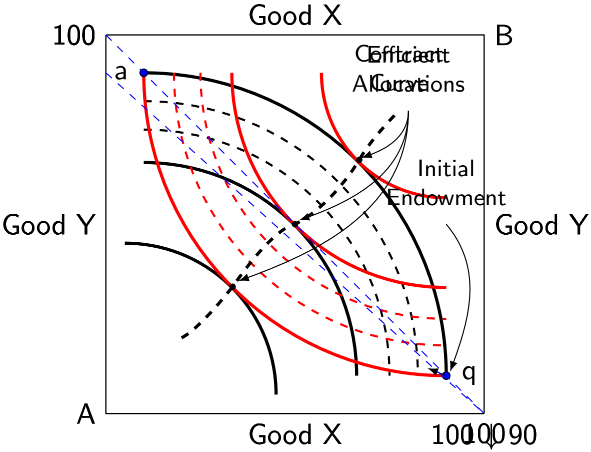


Figure 6: Edgeworth Box shows where marginal rates of substitution equate. **Contract curve**: Locus of Pareto efficient allocations.

2nd Welfare Theorem Fallacy

- In reality, 2WT fails because redistribution of initial endowments is infeasible – they're not observed
- $\Rightarrow$ Gov'ts need **distortionary** taxes and transfers based on economic outcomes (income, working position, wealth, location)
- $\Rightarrow$ Conflict between efficiency and equity: **Equity-efficiency trade-off**

Illustrating 2nd Welfare Theorem fallacy

Suppose 50% of the economy is unable to work due to disability (earn \$0) and 50% can work, earn \$100

Free market outcome: disabled get \$0, able-bodied get \$100

2WT: gov't differentiates disabled and able-bodied perfectly

$\Rightarrow$ taxes the able-bodied \$50 and gives to each disabled person

Instead: gov't can't tell apart disabled/able-bodied, uses work status

$\Rightarrow$ \$50 tax on workers + \$50 transfer to non-workers $\downarrow$ incentive to work
$\Rightarrow$ gov't can no longer do full redistribution
$\Rightarrow$ trade-off between equity and size of economic pie

Why? taxes based on observable, manipulable characteristics

$\Rightarrow$ 2WT is a useful benchmark, but poor practical policy prescription

Summary

- We rely on basic microeconomic tools: utility to represent preferences, budget constraints, utility maximization, demand, supply, equilibrium
- Important concepts: marginal rate of substitution, income and substitution effects, elasticity, Pareto efficiency, deadweight loss
- Welfare theorems:
  - 1st: reference point, we will talk about deviations from it (market failures)
  - 2nd: focus on fairness but unrealistic method of redistribution