Public Economics

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Office Hours: Tuesday afternoon (15h30 – 16h50) – or simply e-mail me

NOVA SCHOOL OF BUSINESS & ECONOMICS

2- Redistribution and Fairness

2.1) Preference-based fairness criteria (Thomson)

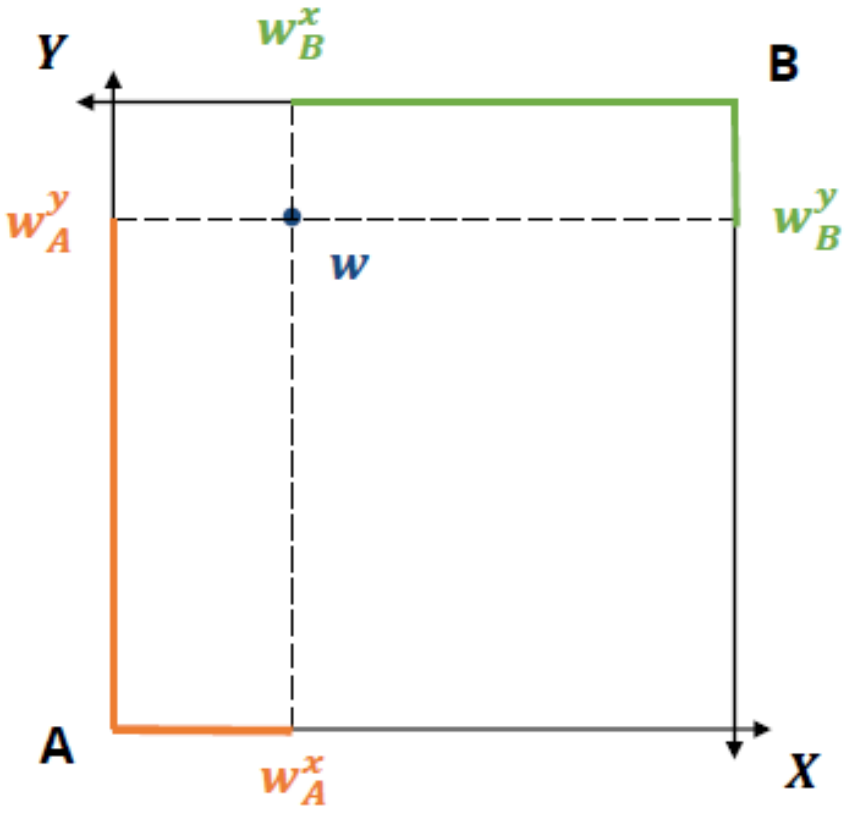
Edgeworth Box

2 * 2 Economy:

- 2 Agents (A and B)
- 2 Goods (Y and X)
- No Production, just trade

Endowments:

- $\mathbf{X} = w_A^x + w_B^x$
- $\mathbf{Y} = w_A^y + w_B^y$



Efficiency + The Contract Curve

Key Concepts:

Competitive Equilibrium:

All agents maximize their utility function s.t. their budget constraint and markets clear

[Budget constraint: $p_x * x_a + p_y * y_a \leq p_x * w_A^x + p_y * w_A^y$]

***1st Welfare Theorem*:**

Equilibrium implies efficiency (but efficiency does not imply an equilibrium)

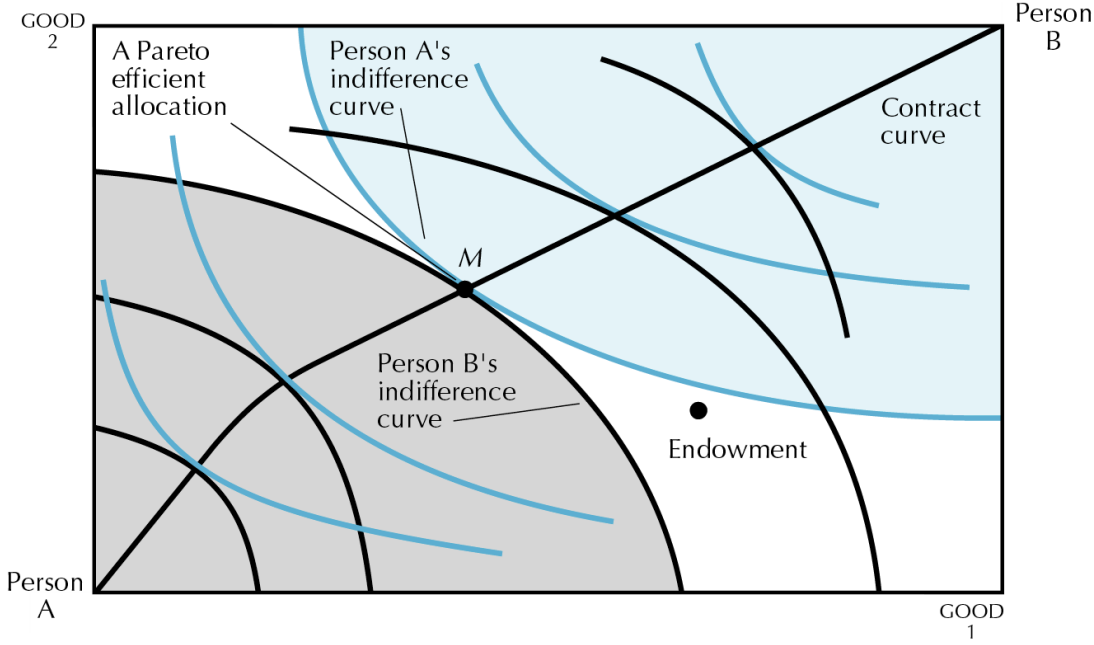
Pareto efficient allocations*:** Points for which there are no Pareto improvements – represented by the ***Contract Curve

How do find the Contract Curve?

Start with **graphical analysis**, and then go to the math

Tool to help visualize:

https://www.econgraphs.org/textbooks/intermediate_micro/exchange



Previous midterms – Fall 22

II (4 points)

Consider an economy with two consumers with utility functions $U_1 = min\{2x_1, y_1\}$ and $U_2 = \sqrt{8x_2.y_2}$. Assume there is 1 unit of x and 2 units of y to distribute among the agents.

a. (2.25 points) Using an Edgeworth box, find the set of Pareto efficient points and find the utility possibility frontier.

Efficient allocations will be such that $2x_1=y_1$ and $2x_2=y_2$
Then, for all efficient allocations, $U_1=2x_1$ and $U_2 = 4x_2$. Therefore, $U_2=4(1- U_1/2)$ and $U_2 = 4-2U_1$.

Grading: 1.25 points for the identification, justification and description of efficient allocations; 1 point for the calculation of the UPF.

b. (1.75 points) Find the Rawlsian choice for this economy. Will the resulting allocation be envy-free?

We want to maximize min $\{U_1,U_2\}$ s.t. $U_2 = 4-2U_1$
We have $U_1=U_2$ and therefore $U_1=U_2=4/3$.
The resulting allocation is $x_1=2/3$, $y_1=4/3$, $x_2=1/3$, $y_2=2/3$ and this is not envy-free: agent 2 will envy agent 1 (and in fact the allocation violates no-domination - and preferences are monotonic).

Grading: 0.5 for the formulation, 0.5 for the solution, 0.5 for the analysis of no-envy and 0.25 for the conclusion.

Deriving Pareto Efficient points

- **Cobb-Douglas [*] + Cobb-Douglas**: Solve $MRS_{x1;y1} = MRS_{x2;y2}$[recall the previous graph];
- **Cobb-Douglas + Perfect Substitutes [+]:** Solve $MRS_{x1;y1} = MRS_{x2;y2}$ and add all points in the graph until the corner of agent with Perfect Substitutes;
- **Cobb-Douglas + Perfect Complements [min]:** Set equal the terms inside brackets of min{} function and add all points until the corner of agent with Cobb-Douglas;
- **Perfect Substitutes + Perfect Substitutes**:

1. If $MRS_{x1;y1} = MRS_{x2;y2}$, then the entire box;
2. If not, all points on the axis in which agents have the full amount of the good they prefer;

- **Perfect Substitutes + Perfect Complements:** Set equal the terms inside brackets of min{} function;
- **Perfect Complements + Perfect Complements:** Set equal the terms inside brackets: the entire area between these functions (and the functions themselves) corresponds to the Pareto efficient allocations;

Preference-based Fairness Criteria

How to define what is a fair distribution of goods?

Utility-based: Utility functions were assumed to have a cardinal meaning (By how much Person A prefers one bundle over another, and also compared with Person B) – interpersonal comparisons

Recall: a utility function represents a consumer's preference relation if it assigns higher numbers to preferred bundles – reason why:

1. any strictly increasing transformation represents the same preferences
2. utility functions normally only have an ordinal meaning

Preference-based: Criteria that no longer assumes a cardinal meaning to utility functions, but rather simply an ordinal one (Person A prefers one bundle over another)

Preference-based Fairness Criteria

How to define what is a fair distribution of goods?

Preference-based:

1. **No-Domination:** No agent should receive more of both goods than the other;
2. **No-Envy:** No agent should prefer another agent's allocation to their own;
3. **Equal Treatment of Equals:** Identical agents should be indifferent between their allocations;
4. **Equal Division Lower Bound:** No agent should be worse-off than equal division of all goods;
5. **Egalitarian Equivalence:** There should exist a bundle (even if unfeasible) such that both agents are indifferent between this bundle and their own allocation.

PS 2: Preference-based Fairness Criteria

Ex.5) Consider the classical setting with 2 agents and 2 goods, where preferences are monotonic and convex.

a) Are efficiency and no-envy compatible?

Yes!

b) Is there a logical connection between no-envy and equal treatment of equals?

Equal treatment of equals implies No-envy! (If same preferences, then the reverse also applies)

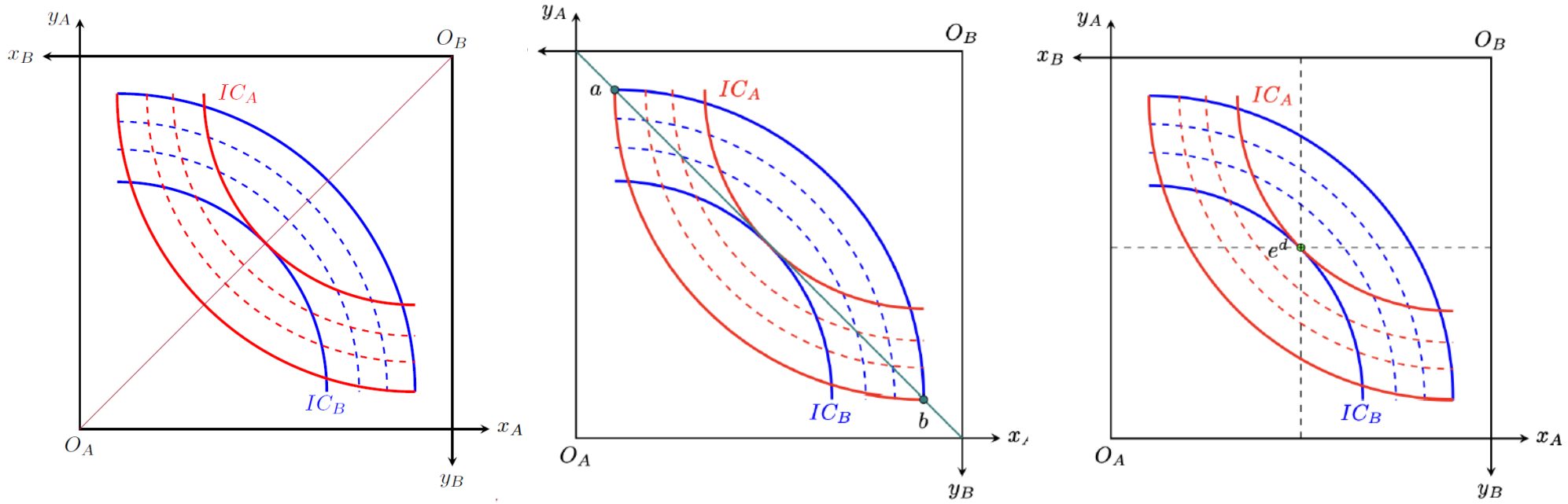
c) If an allocation is envy-free, does it need to satisfy no-domination?

Yes! Contrapositive argument (Domination implies no-envy)

PS 2: Preference-based Fairness Criteria

Ex.5) Consider the classical setting with 2 agents and 2 goods, where preferences are monotonic and convex.

a) Are efficiency and no-envy compatible?



PS 2: Preference-based Fairness Criteria

Ex.6) Consider the classical setting with 2 agents and 2 goods, where the goods are perfect substitutes for both agents

a) Show (in an Edgeworth box) the set of envy-free and efficient allocations.

https://www.econgraphs.org/textbooks/intermediate_micro/exchange/edgeworth_box/efficiency [PEA under different MRS]

b) Show (in an Edgeworth box) the set of efficient allocations that also verify the equal division lower bound

c) Compare your answers to a) and b).

The same!

PS 2: Preference-based Fairness Criteria

Ex.7) Consider the classical setting with 2 agents and 2 goods, where the goods are perfect complements for both agents

a) Show (in an Edgeworth box) the set of envy-free and efficient allocations.

b) Show (in an Edgeworth box) the set of efficient allocations that also satisfy egalitarian equivalence

c) Compare your answers to a) and b).

The same!

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