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**Lecture 03: Edgeworth Boxes**

1. Indifference curves
   1. The Edgeworth box is a model of what Walras mathematically proved.
   2. To set us up for the Edgeworth Box, we need to remember what indifference curves are. Recall they have four assumptions.
      1. Mutually exclusive and completely exhaustive
      2. Convexity
      3. Non-satiation
      4. Downward sloping
2. Indifference curves and efficiency
   1. We start with two hypothetical people: Alpha and Beta. As Walras assumed, we assume no production. Alpha and Omega each get a bundle of two goods: bread and wine.
   2. Now we assume they trade. In this *exchange economy* (two or more people trade two goods with each other) they discover trade opportunities.
   3. We can understand these opportunities through what is *Pareto efficient*—or when no change can make someone else better off without making someone else worse off.
   4. A *Pareto improvement* is when you make someone better off without making anyone worse off. Another way of thinking about Pareto efficient is when there are no Pareto improvements.
      1. It is a very high standard. For example, if Sally breaks up with Ron to date Timmy, it is not a Pareto improvement, even if Sally was miserable with Ron (unless Ron also wanted to break up with Sally).
      2. Finding Pareto improvements get hard when you include people’s meddlesome preferences (e.g. allowing gay marriage would be a Pareto improvement but some people don’t like the idea of gays marrying). But we don’t have anything that complex here. Pareto efficiency might be a too-strict standard in everyday terms but it works fine here.
   5. Recall the Fundamental Theorem of Exchange: trade with complete information is mutually beneficial. If Alpha and Beta trade, it’s a Pareto improvement.
3. Living *In* the Edge
   1. Suppose Alpha’s given 4 loaves of bread and 7 bottles of wine. Also suppose Beta’s given 6 loaves of bread and 3 bottles of wine. We can represent those bundles with a pair of graphs:

Breadα

Wineα

0

2

4

8

10

6

0

2

4

6

10

8

Breadβ

Wineβ

0

2

4

8

10

6

0

2

4

6

10

8

* 1. Let’s combine Alpha’s and Beta’s graphs, rotating Beta’s graph so her bread and wine are on the top and right, respectively.

Breadα

Wineα

0

2

4

8

10

6

0

2

4

6

10

8

2

4

6

8

2

4

6

8

Wineβ

Breadβ

10

10

0

0

* + 1. Thus any loss in one is a gain for the other and vice versa. Note that any point in that box is a potential allocation of bread and wine to each.

Breadα

Wineα

0

2

4

8

10

6

0

2

4

6

10

8

2

4

6

8

2

4

6

8

Wineβ

Breadβ

10

10

0

0

* + 1. But we don’t know how much each values bread and wine. For that, we add indifference curves to the box.
  1. For any exchange between the indifference curves, Alpha and Beta become better off. Since such improvements are Pareto improvements, we would expect them to trade.
  2. This continues until their MRSs equal one another, or when their indifference curves are tangent to one another.
  3. But don’t be fooled: there are multiple equilibria here.

Breadα

Wineα

0

2

4

8

10

6

0

2

4

6

10

8

2

4

6

8

2

4

6

8

Wineβ

Breadβ

10

10

0

0

* 1. Next we connect the dots:

Breadα

Wineα

0

2

4

8

10

6

0

2

4

6

10

8

2

4

6

8

2

4

6

8

Wineβ

Breadβ

10

10

0

0

* 1. We call the resulting the *contract curve*—the line which represents all Pareto efficient allocations of resources between two consumers.
     1. Note that the line begins in ends at the upper right and lower left corners. Why?