Ch 2–3: The PPF and the Gains from Trade

What an economy can make, and why it trades

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Economists build models

Every science simplifies

A physicist drops a marble · ignores the air

We assume two goods · one input · two countries

A model is judged by the question it answers, not by the detail it keeps

Two hats

Scientist: how the economy works

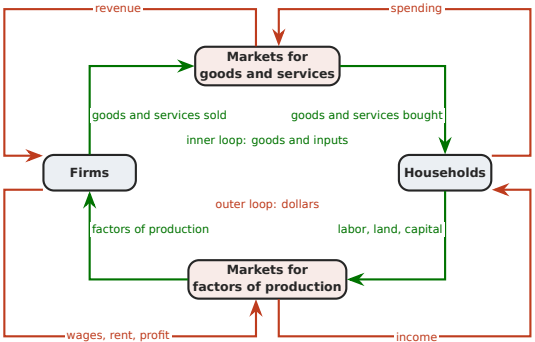
Adviser: what to do about it · needs values too

Positive: how it is · testable
Normative: how it ought to be · *should*

The rest of Ch 2: read it · MindTap asks

Today: what an economy can produce · Then: why it trades

The circular flow



Question

You pay $5 for a coffee. Trace the $5 around the loop. Where does it end up?

The production possibilities frontier

PPF

The combinations of output an economy can produce with its available factors of production and technology.

The United States, alone for now

Two goods: computers and wheat

One input: labor, 50,000 hours a month

Technology

1 computer = 100 hours

1 ton of wheat = 10 hours

Question

All 50,000 hours on computers: how many? All on wheat: how many tons?

Allocate labor, compute output

	Labor hours		Output	
Point	Computers	Wheat	Computers	Wheat (tons)
A	50,000	0		
B	40,000	10,000		
C	25,000	25,000		
D	10,000	40,000		
E	0	50,000		

Allocate labor, compute output

	Labor hours		Output	
Point	Computers	Wheat	Computers	Wheat (tons)
A	50,000	0	500	0
B	40,000	10,000		
C	25,000	25,000		
D	10,000	40,000		
E	0	50,000		

Row A: $50{,}000/100 = 500$ computers, no wheat.

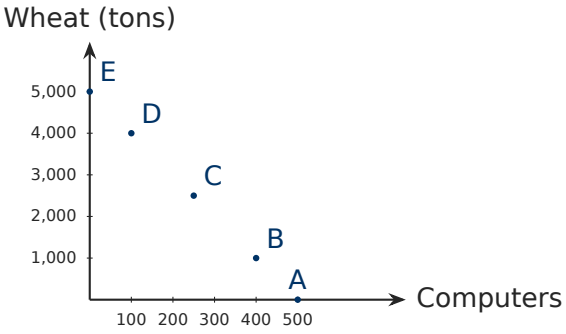
Allocate labor, compute output

	Labor hours		Output	
Point	Computers	Wheat	Computers	Wheat (tons)
A	50,000	0	500	0
B	40,000	10,000	400	1,000
C	25,000	25,000	250	2,500
D	10,000	40,000	100	4,000
E	0	50,000	0	5,000

Row A: $50{,}000/100 = 500$ computers, no wheat.

Row C: $25{,}000/100 = 250$ computers and $25{,}000/10 = 2{,}500$ tons.

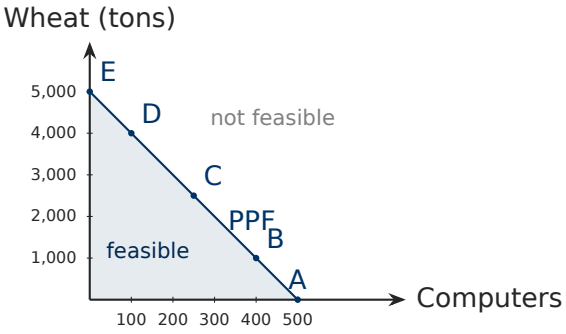
Plot the points, draw the frontier



Each point: one split of the 50,000 hours

Many more splits between them

Plot the points, draw the frontier



Each point: one split of the 50,000 hours

Many more splits between them

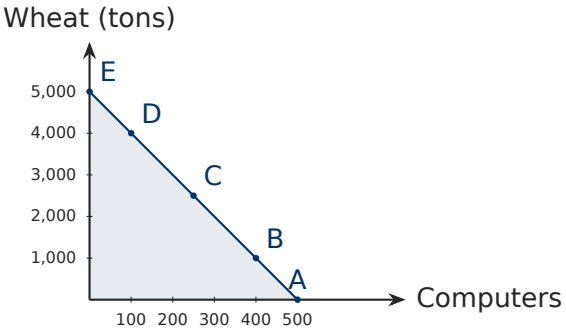
On the line: efficient · every hour used · more of one means less of the other

Inside: feasible · idle hours

Outside: not feasible

Straight: labor at fixed rates

Two more points



Question

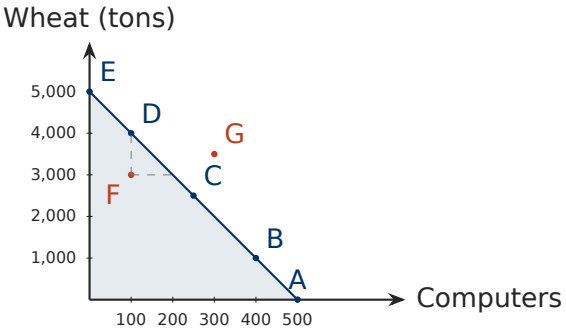
Feasible? Efficient?

F: 100 computers, 3,000 tons

G: 300 computers, 3,500 tons

Hours $= 100\,C + 10\,W$ vs. 50,000

Two more points



Question

Feasible? Efficient?

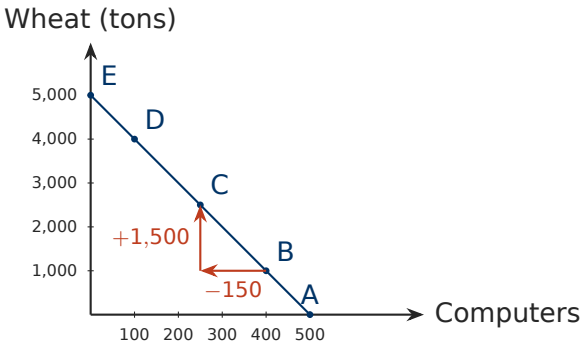
F: 100 computers, 3,000 tons
G: 300 computers, 3,500 tons

Hours $= 100\,C + 10\,W$ vs. 50,000

F: $10{,}000 + 30{,}000 = 40{,}000$ feasible · 10,000 hours idle · inefficient

G: $30{,}000 + 35{,}000 = 65{,}000$ not feasible

Opportunity cost is the slope



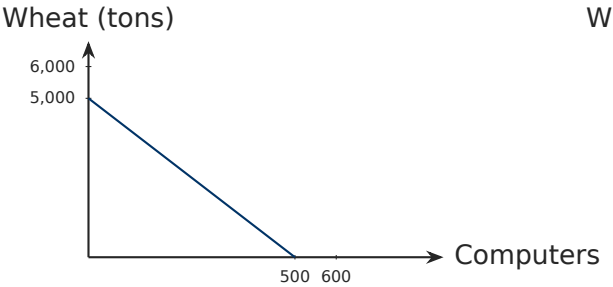
Principle 2: cost is what you give up

A to B: -100 computers, $+1{,}000$ tons
B to C: -150 computers, $+1{,}500$ tons

Along this PPF

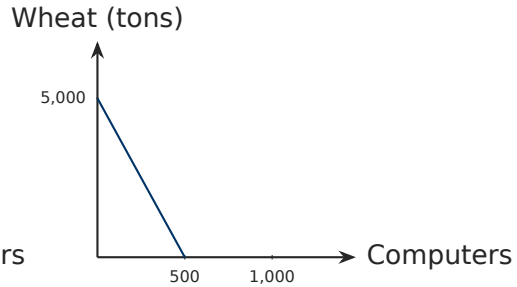
1 computer costs 10 tons of wheat
1 ton costs $1/10$ computer
$|\text{slope}| = 5{,}000/500 = 10$

The frontier moves



More labor

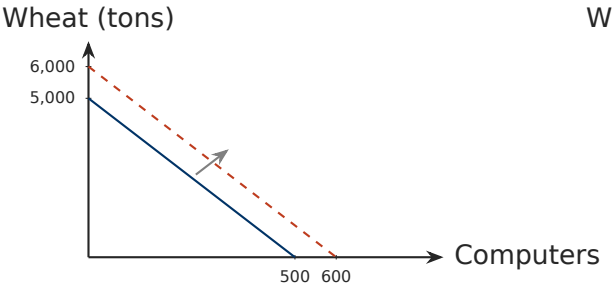
Immigration: 60,000 hours



Better technology

A computer now takes 50 hours

The frontier moves

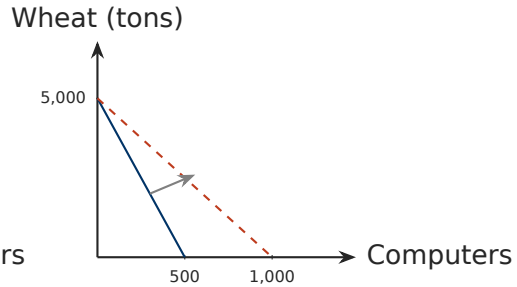


More labor

Immigration: 60,000 hours

600 computers or 6,000 tons

Parallel shift · slope still 10



Better technology

A computer now takes 50 hours

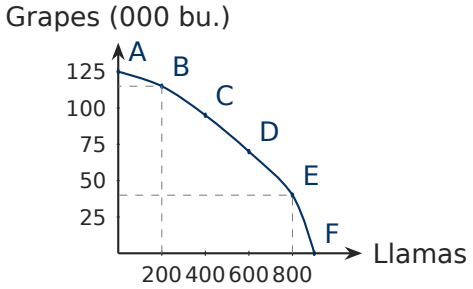
1,000 computers or 5,000 tons

Pivot · a computer now costs 5 tons

A bowed-out PPF: grapes and llamas

Some land fertile, some rocky · llamas do fine anywhere, grapes do not

	Llamas	Grapes (000 bu.)	Cost/llama (bu.)
A	0	125	
B	200	115	50
C	400	95	100
D	600	70	125
E	800	40	150
F	900	0	400



Question

From A, what do the first 200 llamas cost in grapes? What do the last 100 (E to F) cost?

Why the bow?

First 200 llamas

10 thousand bushels · 50 per llama

They go on rocky land that grew little

Last 100 llamas

40 thousand bushels · 400 per llama

They displace the best vineyard

Rule

Straight PPF: constant opportunity cost · identical resources

Bowed-out PPF: increasing opportunity cost · resources differ · the cheap units come first

Why trade?

Almost everything you own was made by people you will never meet

Grow your own food · sew your own clothes · build your own phone

Principle 5: trade can make everyone better off

The hard case

One country is better at producing *everything*

Should it trade at all?

Does the other country gain, or get exploited?

Question

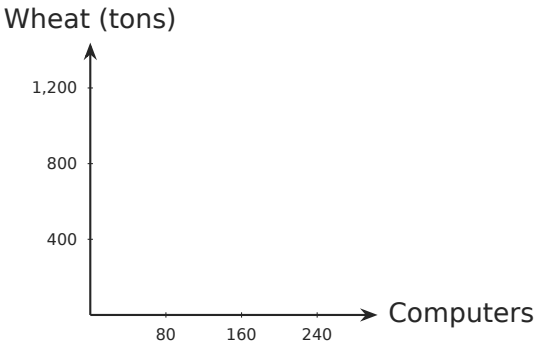
"Trade with China makes most Americans better off because, among other things, they can buy goods that are made more cheaply there." Agree, disagree, or uncertain?

A second country

	Hours	per computer	per ton
U.S.	50,000	100	10
Japan	30,000	125	25

Question

Find the endpoints of Japan's PPF.



A second country

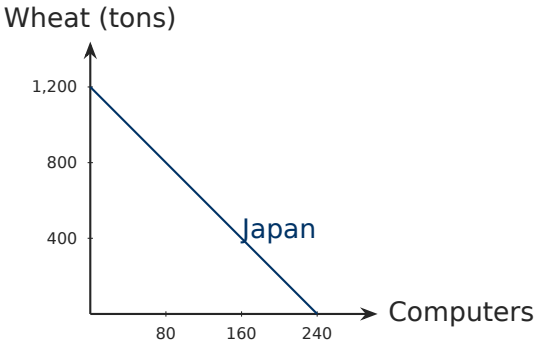
	Hours	per computer	per ton
U.S.	50,000	100	10
Japan	30,000	125	25

Question

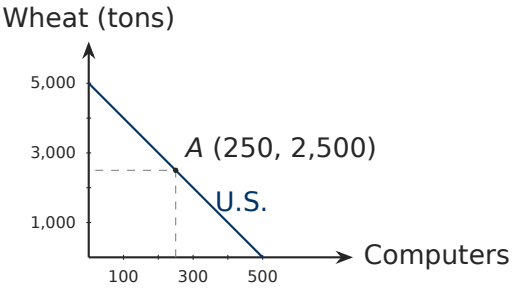
Find the endpoints of Japan's PPF.

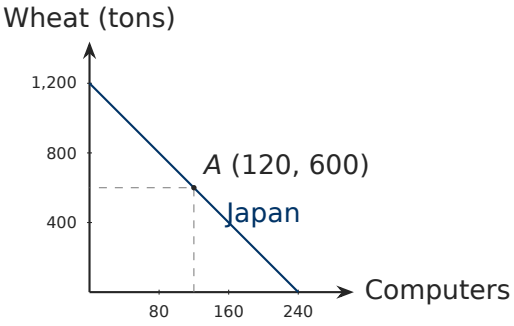
All computers: $30{,}000/125 = 240$

All wheat: $30{,}000/25 = 1{,}200$ tons



Without trade: consume what you produce





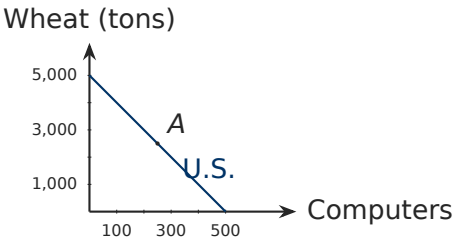
Half the labor on each good · U.S.: 250 computers, 2,500 tons · Japan: 120 computers, 600 tons

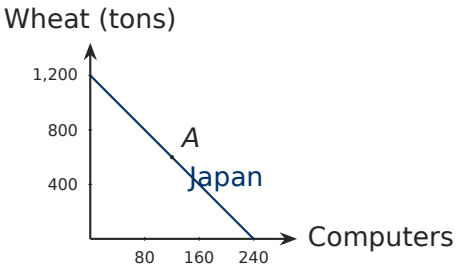
No trade: you eat what you make · consumption is a point on the PPF

Production with trade

Question

The U.S. grows 3,400 tons of wheat: how many computers with the rest? Japan builds 240 computers: how much wheat?





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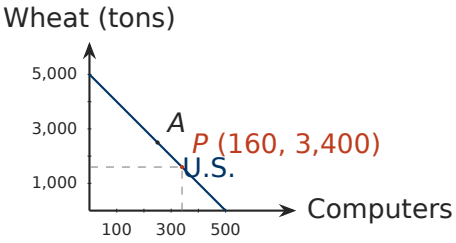
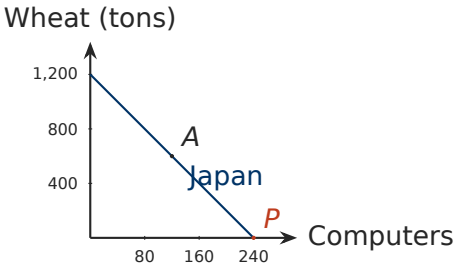


34,000 h on wheat · 16,000 left → 160 computers



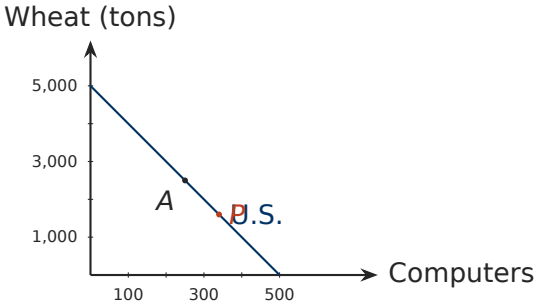
All 30,000 h → 0 wheat · P (240, 0)

U.S. leans to wheat · Japan all in on computers · both still on the PPF

U.S. consumption with trade

Exports: made here, sold abroad · **Imports**: made abroad, bought here

The deal: the U.S. ships 700 tons of wheat to Japan · Japan ships 110 computers to the U.S.



	Computers	Wheat
Produced	160	3,400
+ Imported	110	0
− Exported	0	700
= Consumed		

U.S. consumption with trade

Exports: made here, sold abroad · **Imports**: made abroad, bought here

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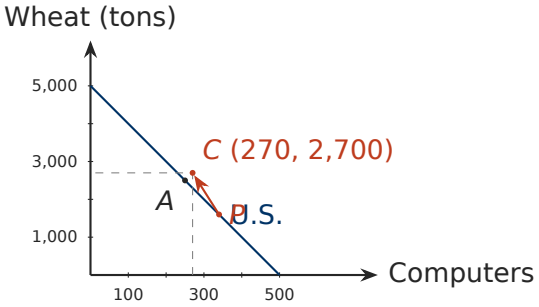
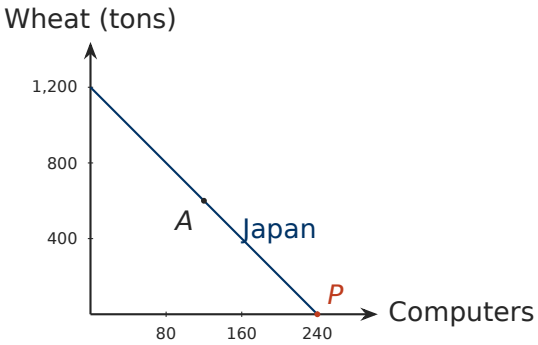


	Computers	Wheat
Produced	160	3,400
+ Imported	110	0
− Exported	0	700
= Consumed	270	2,700

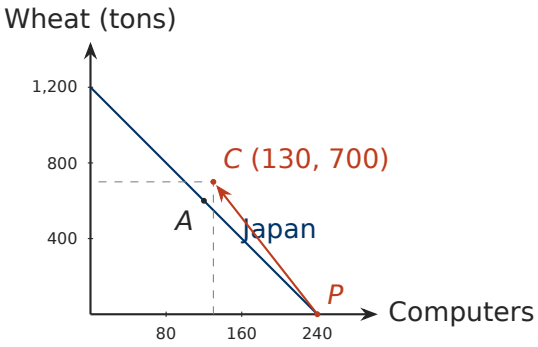
C is outside the U.S. PPF · the U.S. could not make this bundle alone

Japan's consumption with trade



	Computers	Wheat
Produced	240	0
+ Imported	0	700
− Exported	110	0
= Consumed		

Japan's consumption with trade



	Computers	Wheat
Produced	240	0
+ Imported	0	700
− Exported	110	0
= Consumed	130	700

Japan grows no wheat, eats 700 tons · C outside its PPF too

Both gain

United States

	No trade	Trade	Gain
Computers	250	270	+20
Wheat	2,500	2,700	+200

Japan

	No trade	Trade	Gain
Computers	120	130	+10
Wheat	600	700	+100

World output: computers $370 \to 400$ · wheat $3{,}100 \to 3{,}400$

Same labor, same technology, bigger pie

Trade untied consumption from production · it works like a better technology

Where do the gains come from?

Absolute advantage · fewer inputs

Hours per	computer	ton
U.S.	100	10
Japan	125	25

The U.S. wins on *both*

So why buy computers from Japan?
Why does Japan gain?

Opportunity cost · what is given up

Cost of a computer = the wheat those hours could have grown

U.S.: 100 hours $= 100/10 =$ 10 tons

Japan: 125 hours $= 125/25 =$ 5 tons

Measured in wheat given up, a computer is cheaper in Japan

Comparative advantage

Comparative advantage: producing a good at a *lower opportunity cost* than another producer

Opportunity cost of…	1 computer	1 ton of wheat
United States	10 tons wheat	1/10 computer
Japan	5 tons wheat	1/5 computer
Comparative advantage	Japan	United States

Principle

Each good is made by the party with the lower opportunity cost · specialize, trade for the rest · the gain is the difference in opportunity cost

The two costs are reciprocals · absolute advantage in both: possible · comparative advantage in both: never

The price of trade

Japan's cost: 5 tons · it sells for *more* than 5

U.S. cost: 10 tons · it buys for *less* than 10

Both gain only if

$5 <$ price of a computer < 10 tons of wheat

Our deal: 700 tons for 110 computers

$700/110 \approx 6.4$ tons per computer

Between the two opportunity costs · both sides better off

Question

Japan asks 12 tons per computer. Or the U.S. offers 4. What happens?

Argentina and Brazil

Hours per unit (10,000 hours each)	1 lb coffee	1 bottle wine
Argentina	2	4
Brazil	1	5

Question

Absolute advantage in coffee? Comparative advantage in wine? Terms of trade?

Argentina and Brazil

Hours per unit (10,000 hours each)	1 lb coffee	1 bottle wine
Argentina	2	4
Brazil	1	5

Question

Absolute advantage in coffee? Comparative advantage in wine? Terms of trade?

- Absolute advantage in coffee: Brazil · 1 hour vs. 2
- Wine costs Argentina $4/2 = 2$ lb of coffee, Brazil $5/1 = 5$ lb · comparative advantage: Argentina
- Coffee costs Argentina 0.5 bottle, Brazil 0.2 · Brazil
- A bottle of wine trades for 2 to 5 lb of coffee

Should LeBron mow his own lawn?

LeBron

Mows the lawn in 2 hours
In 2 hours he could film a commercial: $30,000

The kid next door

Mows it in 4 hours
In 4 hours he could earn $50 at McDonald's

Absolute advantage in mowing: LeBron

Opportunity cost of mowing: $30,000 vs. $50

Comparative advantage in mowing: the kid

Any price between $50 and $30,000 makes both better off

This is why you do one job and buy everything else

Trade with China

The survey, again

"Trade with China makes most Americans better off"

IGM panel of economists: nobody disagreed

"Some Americans who work in industries that compete with Chinese imports are made worse off"

Also near-unanimous agreement

Both are true

Same logic as U.S.–Japan: lower opportunity cost abroad, import it, move labor to your comparative advantage

Trade creates winners and losers

Gains exceed losses · compensation is not automatic

The losers are concentrated, the winners spread thin · politics follows

Summary

The PPF

- On the line efficient · inside inefficient · outside infeasible
- Opportunity cost is the slope
- More resources: shift out · one-sided technology: pivot
- Bowed out: increasing opportunity cost

Trade

- Absolute advantage: fewer inputs · comparative advantage: lower opportunity cost
- Gains come from comparative advantage · nobody has it in everything
- Specialize, trade for the rest · consume outside your PPF
- Price lies between the two opportunity costs

Next: Ch 4, Supply and demand.

MindTap: register before Sep 13.