

Issues in International Finance

Benefits of international capital markets

UW – Madison // Fall 2018

Roadmap

► Where we have been

1. Measuring external transactions and wealth
2. Unbalanced trade means borrowing or lending with ROW
3. The long run budget constraint

► Today

1. The gains from international borrowing and lending
2. Consumption smoothing, efficient investment, risk diversification



Open economy vs. closed economy

- ▶ In a closed economy, $TB = 0$. **Budget must balance every period.**

$$GNE = GDP$$

- ▶ In a closed economy $TB \neq 0$. **Budget must balance in the long run.**

$$\underbrace{GNE_0 + \frac{GNE_1}{(1+r^*)} + \dots}_{\text{PV spending}} = \underbrace{(1+r^*)W_{-1}}_{\text{initial wealth}} + \underbrace{GDP_0 + \frac{GDP_1}{(1+r^*)} + \dots}_{\text{PV income}}$$

self insurance

Gains from intertemporal trade

- ▶ In “trade” class, learn about gains from trade
 - ▶ Comparative advantage
 - ▶ Heckscher-Ohlin
 - ▶ Gains from variety
 - ▶ Trade is balanced — do not discuss current accounts
- ▶ We are considering unbalanced trade
 - ▶ Trading over time: intertemporal trade
 - ▶ Associated with international borrowing and lending
- ▶ Gains from intertemporal trade
 1. Consumption smoothing
 2. Efficient investment
 3. Risk diversification

*international
finance.*

Consumption smoothing

► Assumptions

1. A representative household (not important)
2. The household wants smooth consumption (important)
3. No G or I (will relax later)
4. $W_{-1} = 0$ (not important)
5. Country is small: cannot affect r^* (not important)

► Consider a two-period world. The LRBC is

$$C_0 + \frac{C_1}{1 + r^*} = Q_0 + \frac{Q_1}{1 + r^*}$$

► $C = GNE$ (since $G = I = 0$) and $Q = GDP$

Consumption smoothing

- ▶ Let's rewrite the LRBC

$$C_0 + \frac{C_1}{1+r^*} = Q_0 + \frac{Q_1}{1+r^*}$$

$$\underbrace{C_1}_{\xi} = \underbrace{Q_1}_{\xi} + (1+r^*)(Q_0 - C_0)$$

- ▶ If $Q_0 - C_0 < 0$
 - ▶ Consume more than output in period 0
 - ▶ Consume less than output in period 1
- ▶ Opposite is true if $Q_0 - C_0 > 0$
- ▶ The relative price of period 1 consumption is $1 + r^*$

Consumption smoothing

- ▶ How should the household set C_0 and C_1 ?
- ▶ Need an intertemporal utility function
- ▶ Example:

$$U(C_0, C_1) = \min\{C_0, C_1\}$$

- ▶ The solution to this is $C_0 = C_1$ ← what household wants.
- ▶ If $Q_0 = Q_1$, this is easy: $C_0 = Q_0$ and $C_1 = Q_1$
- ▶ What about times when $Q_0 \neq Q_1$?
 - ▶ Recessions/expansions ~ business cycles.
 - ▶ War/peace
 - ▶ Natural disasters

Consumption smoothing

- ▶ An example: $Q_0 = 100$, $Q_1 = 105$, and $r = 0.05$
- ▶ In a closed economy, $C_0 = 100$, $C_1 = 105$ and $U = \min\{100, 105\} = 100$
 - ▶ Consumption is not smooth
- ▶ In an open economy

$$C_0 + \frac{C_1}{1.05} = \underbrace{Q_0}_{100} + \frac{\underbrace{Q_1}_{105}}{1+r}$$

$$\overset{e}{C_0} + \frac{\overset{e}{C_1}}{1.05} = 200 \quad \leftarrow \text{PV income}$$

- ▶ We want $C_0 = C_1 = C$, so

$$C \left(1 + \frac{1}{1.05} \right) = 200 \quad \leftarrow \text{solve this for } C$$

- ▶ $C = 102.44$, $U = \min\{102.44, 102.44\} = 102.44$

Consumption smoothing

- ▶ The household is better off in the open economy because it has a smoother consumption path
- ▶ The BOP accounting

Time 0:

$$TB_0 = Q_0 - C_0 = 100 - 102.44 = \underline{-2.44}$$

$$CA_0 = -2.44 + 0 = -2.44, (NFA = 0)$$

$$FA_0 = 2.44$$

exporting an asset worth 2.44

trade deficit

- ▶ Borrow 2.44 in period 0, pay back with interest in period 1

Time 1

$$TB_1 = Q_1 - C_1 = 105 - 102.44 = 2.56$$

$$CA_1 = \underline{2.56} - 0.1215 = 2.44, (NFA = -2.44 * 0.05 = -0.1215)$$

$$FA_1 = -2.44$$

importing back the asset.

$$L \times r =$$

trade surplus.

Consumption smoothing

- ▶ The two-period example extends naturally to many periods
- ▶ Output is 79, then 100 forever

	0	1	2	...	present value
Q	79	100	100		2,709
C	99	99	99	...	2,709
TB	-20	1	1	...	0
CA	-20	0	0	...	
NFIA	0	-1	-1	...	

- ▶ Does not pay off debt, makes interest payments forever

Consumption smoothing

institutional factors

... government quality, laws, financial ...

- ▶ Less developed countries worry about access to international borrowing
 - ▶ Often, international lenders do not want to lend to countries during recessions (worry about repayment)
- ▶ These economies build up a stock of foreign assets ($W \gg 0$) to spend during recessions, rather than borrow. ~ SELF INSURANCE
- ▶ This kind of savings takes two forms
 - ▶ Central bank foreign reserves (hold dollars, euros, ...)
 - ▶ Sovereign wealth funds (buy assets in other countries)

↳ Gov't holds foreign assets

Norway (oil)

Chile (Copper)

SA (oil)

Gains from intertemporal trade

- ▶ Gains from intertemporal trade
 1. Consumption smoothing ✓
 2. Efficient investment
 3. Risk diversification

Efficient investment

investment: trade off some cons.
today for more out tomorrow

- ▶ Add investment to our previous model (labor & capital create output)

$$C_0 + I_0 + \frac{C_1}{1+r^*} = Q_0 + \frac{Q_1}{1+r^*}$$

- ▶ With $I_0 = 0$: $Q_0 = Q_1 = 100$

- ▶ With $I_0 = 5$: $Q_0 = 100, Q_1 = 110$

- ▶ In a closed economy either

- ▶ $I_0 = 0$ and $C_0 = 100, C_1 = 100$ $u = \min\{100, 100\} = 100$

- ▶ $I_0 = 5$ and $C_0 = 95, C_1 = 110$ $u = \min\{95, 110\} = 95$

- ▶ Very unsmooth consumption if investment is made

Efficient investment

- ▶ In an open economy

$$C_0 + \overset{I_0}{\underset{\xi}{5}} + \frac{C_1}{1.05} = \overset{Q_0}{100} + \frac{\overset{Q_1}{110}}{1.05}$$

$$\underline{\sum} C \left(1 + \frac{1}{1.05} \right) = 95 + \frac{110}{1.05}$$

▶ $C_0 = C_1 = 102.32$

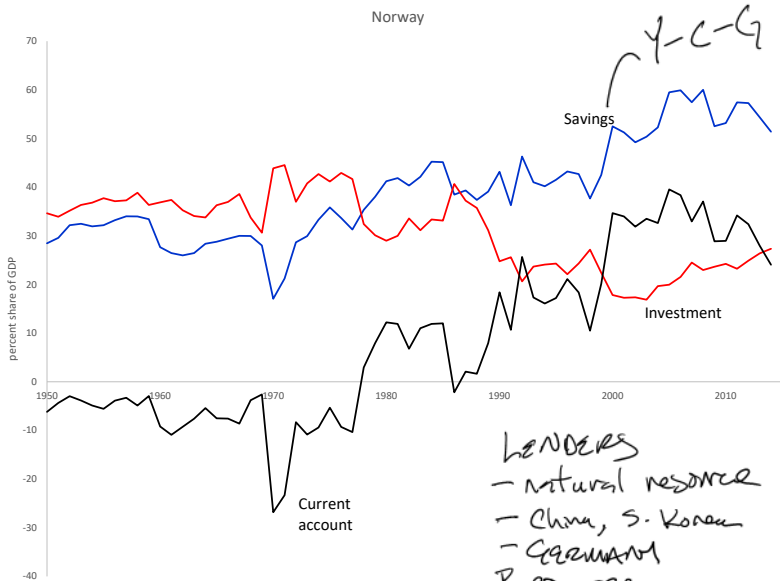
▶ $TB_0 = Q_0 - C_0 - I_0 = 100 - 102.32 - 5 = 7.32$

- $100 - 102.32 - 5 = -7.32$
- ▶ Borrow the entire investment plus more!

- ▶ Consume more today because you will be richer tomorrow

Efficient investment

- ▶ We have seen some of this before $S - I = CA$
- ▶ International borrowing/lending allows for smoother consumption while still taking advantage of investment opportunities
- ▶ Example: Norway
 - ▶ Massive investments in North Sea oil drilling
 - ▶ Would payoff in the future
 - ▶ Borrow from abroad to fund investment



$$CA = S - I$$

LENDERS

- natural resource
- China, S. Korea
- Germany

BORROWERS

EMERGING & LDC

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Gains from intertemporal trade

- ▶ Gains from intertemporal trade
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Efficient investment

- ▶ We have seen how world capital markets allow for smoothing the costs of investment: very similar to the consumption smoothing benefit we studied earlier.
- ▶ Now we consider a second aspect of investment: moving capital across countries to equalize returns
- ▶ This is a long run idea. Remember: with flexible prices and open capital markets, we have real interest rate parity. Let's see what this implies.

Optimal capital investment

investment in physical capital
finance investment with a loan

- ▶ Production function (A =productivity, K =capital, L =labor)

$$\frac{Q}{L} = A \frac{L^{1-\theta}}{L} K^\theta \sim \frac{1}{3}$$

- ▶ In per worker terms (k =capital per worker)

output
per worker

$$q = Ak^\theta$$

capital
per worker

$$q = \frac{Q}{L}$$

$$q = A L^{-\theta} K^\theta = A \left(\frac{K}{L}\right)^\theta$$

- ▶ To maximize output, how much capital do we choose?

$$\max_k \quad \cancel{q} Ak^\theta - rk$$

derivative = 0

- ▶ The first order condition is

$$\theta Ak^{\theta-1} = r$$

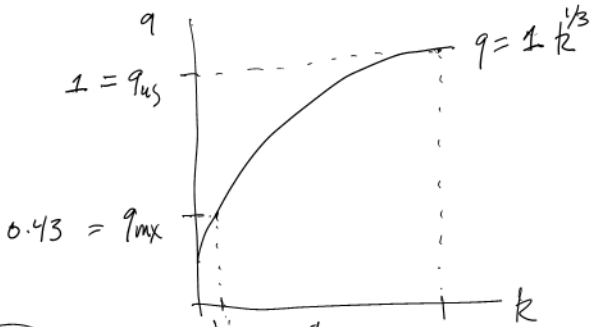
The marginal product of capital

- ▶ The first order condition says that $MPK = r$

$$\theta A k^{\theta-1} = r$$

$$\frac{\theta A}{k^{1-\theta}} = r$$

- ▶ r is the marginal cost of capital: if not investing in capital, could be lending to someone
- ▶ MPK is falling as k grows
 - ▶ This is the diminishing returns to capital
 - ▶ When k is small, MPK is high
 - ▶ When k is large, MPK is low
- ▶ $A = 1$ and $\theta = 1/3$ Let's take a look...

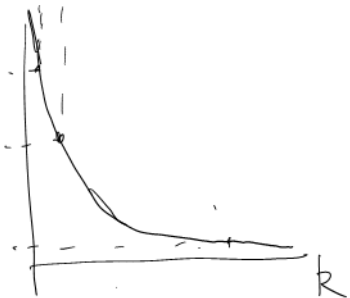
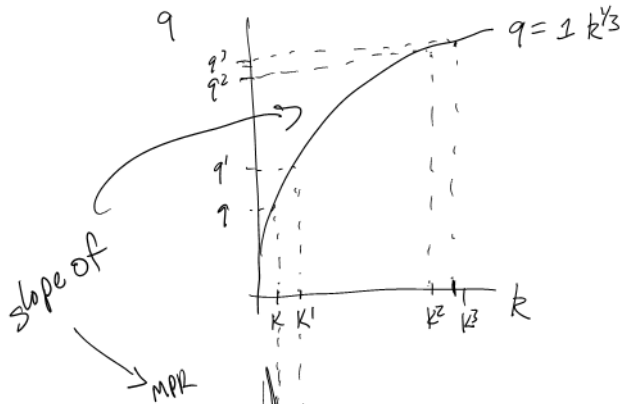


$\frac{MPR_{\max}}{MPR_{us}} = 5.4$



$1.79 = \frac{0.08^{-2/3}}{3} = MPK_{\max}$

$MPK = \frac{1}{3} k^{-2/3}$

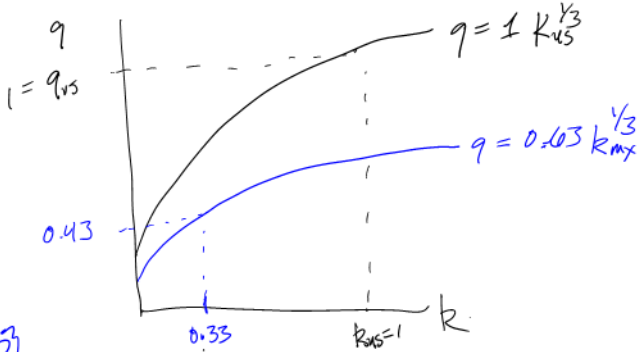


MPK in rich and poor countries

- ▶ Two countries: US and Mexico
- ▶ Assumption: A and θ are the same in both countries
- ▶ $k^{us} = 1, k^{mx} = 0.08$
- ▶ $q^{us} = 1, q^{mx} = 0.43$
- ▶ Mexico is poor relative to the US because it doesn't have enough factories, trucks, machines...
- ▶ ...but Mexico should be a great investment opportunity!
- ▶ $MPK^{us} = 0.333, MPK^{mx} = 1.79 \rightarrow MPK^{mx} / MPK^{us} = 5.4$
- ▶ Capital should flow to Mexico
out of US.

MPK in rich and poor countries

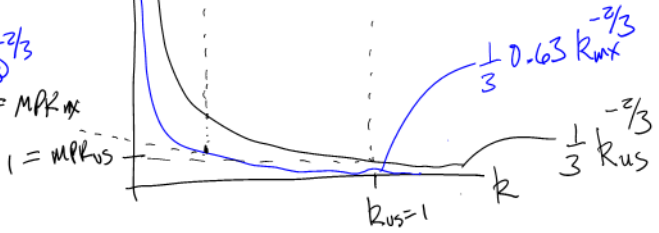
- ▶ Capital should flow out of rich countries and into poor countries (capital flows to places with highest returns)
- ▶ Eventually all countries **converge** to the same level of k and then r will be same across countries (we have already seen this result)
- ▶ This is a very powerful (and optimistic) implication of economic theory: poor countries will become rich countries!
- ▶ We can speed up this transition by subsidizing loans to poor countries or giving 'gifts'



$$\frac{MPR_{k_{mx}}}{MPR_{k_{us}}} = \underline{\underline{1.33}}$$

$$MPR = \theta A k^{\theta-1}$$

$$\frac{0.44}{3} = \frac{1}{3} 0.63 (0.33)^{-2/3} = MPR_{k_{mx}}$$



The Lucas Paradox

- ▶ Problem: we do not observe capital flowing out of rich countries and into poor countries (we even see the opposite)
- ▶ What model assumption should we get rid of? Identical A.
- ▶ Suppose $A^{mx} = 0.63$ and $A^{us} = 1$
- ▶ Need $k^{mx} = 0.33$ to have the same output as before

$$q = A \left(\frac{K}{L} \right)^\theta$$

Technology in rich and poor countries

- ▶ $k^{us} = 1, k^{mx} = 0.33$
- ▶ $q^{us} = 1, q^{mx} = 0.43$
- ▶ Mexico is poor relative to the US because it doesn't have enough factories, trucks, machines... and because it cannot produce as much output per unit of capital
- ▶ The *MPK* difference falls dramatically
- ▶ $MPK^{us} = 0.333, MPK^{mx} = 0.44 \rightarrow MPK^{mx} / MPK^{us} = 1.33$
- ▶ The returns are not so different anymore...

Don't expect drastic capital flows
Don't expect convergence.

What is A?

- ▶ Total factor productivity (TFP)
- ▶ Most of the differences in q across countries come from A
- ▶ It is an unobserved 'residual'
 - ▶ If you know K , L , and Q you can compute A
- ▶ It is technological efficiency
 - ▶ Do poor countries use worse technology? To some extent, but not thought to be the big difference across countries.
- ▶ It reflects the ability to implement technologies
 - ▶ Institutional quality: How good is the government? How much red tape? Bribes? Infrastructure?
- ▶ The World Bank doing business is inspired by this idea

<http://www.doingbusiness.org/>

$$Q = A L^{1-\alpha} K^\alpha$$
$$A = \frac{Q}{L^{1-\alpha} K^\alpha}$$

The Lucas Paradox

- ▶ Why doesn't capital flow to poor countries?
- ▶ The rate of return is much lower than simply theory predicts
 - ▶ TFP differences across countries
 - ▶ Risk premiums (poor countries default more)
- ▶ Downer: Giving subsidized loans (or aid) not likely to help much

Gains from intertemporal trade

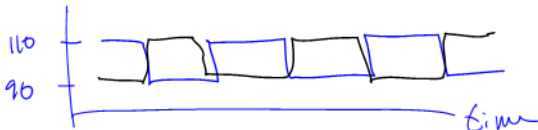
- ▶ Gains from intertemporal trade
 1. Consumption smoothing ✓
 2. Efficient investment ✓
 3. Risk diversification

Risk diversification

- ▶ Business cycles are shocks to income; households would like smooth consumption
- ▶ We studied one way to smooth consumption: debt
- ▶ Another way to smooth consumption is to smooth income: hold equity in other countries
- ▶ Since business cycles are not perfectly synchronized across countries, this allow for diversification of risk
- ▶ The more out-of-sync are business cycles, the more room there is for risk sharing

Diversification

- ▶ Assumption: Labor and capital used to produce output
- ▶ Assumption: No borrowing or lending (not important)
- ▶ Assumption: No investment, no government (not important)
- ▶ Assumption: Two countries suffer equal and opposite shocks to income (important)
 - ▶ In state 1: $Q^A = 90$, $Q^B = 110$ *even years*
 - ▶ In state 2: $Q^A = 110$, $Q^B = 90$ *odd years*
 - ▶ States alternate through time: 1,2,1,2,1,2...
- ▶ Split between labor and capital is 60–40 (important)



Closed economy

- ▶ No cross border borrowing/lending or equity
- ▶ Each country owns all of its capital stock

	Country A			Country B			World
	rK	wL	GNI	rK	wL	GNI	GNI
State 1	36	54	90	44	66	110	200
State 2	44	66	110	36	54	90	200

Handwritten annotations: A double-headed arrow between the GNI columns of Country A and Country B is labeled '18' on the left and '22' on the right. The GNI values 90 and 110 in State 1 are circled, and 44 and 66 in State 2 are also circled.

- ▶ In each country, consumption alternates between 90 and 110. Not very smooth.
- ▶ World output (income) is constant

Open economy

- ▶ Allow countries to own some of the other country's capital stock
- ▶ Receive income payments from your capital in the other country
- ▶ Suppose each country buys 50% of the other country's capital

	Country A					Country B			World
	rK	wL	GNI	TB	NFIA	rK	wL	GNI	GNI
State 1	40	54	94	-4	+4	40	66	106	200
State 2	40	66	106	+4	-4	40	54	94	200

- ▶ Capital income has zero volatility

$$C = 94, 106, 94, 106$$

$$\neq 90, 110, 90, 110, \dots$$

- ▶ Income (and consumption) volatility has fallen

Limits to risk sharing

- ▶ The extent of risk sharing depends on two factors

1. The correlation of country income

- ▶ Income shocks that are negatively correlated can be diversified
- ▶ Income shocks that are positively correlated cannot

2. How much income can be traded

- ▶ How easy is it to own capital in a foreign country?
- ▶ Not generally easy to own someone else's labor income

Gains from intertemporal trade

- ▶ Gains from intertemporal trade
 1. Consumption smoothing ✓
 2. Efficient investment ✓
 3. Risk diversification ✓
- ▶ Q: How much of the gains do we see?
- ▶ A: Not as much as theory predicts.
 - ▶ Consumption is not very smooth
 - ▶ Cross border investment is low
 - ▶ Portfolios are biased toward domestic assets
- ▶ Tends to be worse in poorer countries

Limits to international financial markets

- ▶ Why do we not see more international finance?
 - ▶ Regulation (limits to foreign investment)
 - ▶ Capital controls
 - ▶ Transactions costs
 - ▶ Institutional risk (expropriation, default)
 - ▶ Undiversifiable risk (global shocks, labor income shocks)
- ▶ Many of these are institutional factors

